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[COMMITTEE PRINT NO. 11]

THE CONTRIBUTION OF IRRIGATION AND THE CENTRAL VALLEY PROJECT TO THE ECONOMY OF THE AREA AND THE NATION

REPORT

BY

BUREAU OF RECLAMATION
UNITED STATES DEPARTMENT OF THE INTERIOR

FOR THE USE OF THE

COMMITTEE ON INTERIOR AND INSULAR AFFAIRS
HOUSE OF REPRESENTATIVES

MARCH 1956

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STATEMENT OF THE CHAIRMAN

MARCH 1956.

To Members of the House Interior and Insular Affairs Committee:

On many occasions I have pointed out that, in my opinion, the relatively small Federal expenditures in our Reclamation program constitute the Nation's wisest investment. Not only are the moneys returned to the Federal Treasury but new areas are developed and new wealth is created which strengthen materially the economy of the project area and the Nation.

Much information has been made available on the tangible effects of Reclamation developments; however, very little has been said or published on the intangible effects—such as the impact of these developments on the local and national economy. In order to obtain more specific information along these lines, I requested the Commissioner of Reclamation to select a few representative projects and furnish the committee information indicating the contributions which these projects are making to the maintenance of our present high economic level. Several of these studies have been completed and I believe the information set out therein will be of interest to each of you and to the general public.

The study included in this particular document relates to the Central Valley project of California. It shows that the impact of the Central Valley project on the economy of the Central Valley and on the economy of the Nation already has been tremendous, even though the area to be served eventually is only partially developed. The initial features of the Central Valley project have been completed for several years but during 1953, the year covered by the facts and figures shown in this study, the initial features of the Central Valley project were supplying only 52 percent of the water they will ultimately serve in the valley. Under full operation of these facilities, the project's impact on the economy of the valley and the Nation should almost double the results outlined in this report.

CLAIR ENGLE,
Chairman, Committee on Interior and Insular Affairs.

LETTER OF TRANSMITTAL

UNITED STATES DEPARTMENT OF THE INTERIOR,
BUREAU OF RECLAMATION,
Washington 25, D. C., February 17, 1956.

Hon. CLAIR ENGLE,
House of Representatives,
Washington 25, D. C.

MY DEAR MR. ENGLE: In your letter of March 5, 1955, it was suggested that the general information submitted earlier and published as committee print No. 27 be supplemented with more detailed information concerning individual projects, including some of the larger projects, such as the Central Valley project, in California, and the Columbia Basin project, in Washington.

Two copies are enclosed of a report: The Contribution of Irrigation and the Central Valley Project to the Economy of the Area and the Nation. The contribution of the irrigation aspects of the project and the contribution of irrigation in general in the 18 counties of the Central Valley area attest to the importance and value of irrigation in providing opportunities in farming and all the associated industrial and corollary trades and professions with attendent high levels of living and extensive local, interstate, and intrastate business.

Data for the preparation of this report are from Bureau records and published reports of other agencies. A more complete report will be possible when additional features of the Central Valley project are completed and in full operation.

Your comments and suggestions regarding the report will be appreciated.

Sincerely yours,

W. A. DEXHEIMER, *Commissioner.*

THE CONTRIBUTION OF IRRIGATION

AND THE

CENTRAL VALLEY PROJECT

TO

THE ECONOMY OF THE AREA AND THE NATION

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

LETTER OF SUBMITTAL

UNITED STATES DEPARTMENT OF THE INTERIOR,
BUREAU OF RECLAMATION,
REGIONAL OFFICE, REGION 2,
Sacramento, Calif., August 12, 1955.

To: Commissioner.
From: Regional Director.
Subject: Contributions of the Central Valley Project to the Economy—Central Valley Project, California—Region 2.

Your speedletter of March 11, 1955, requested that we prepare a report on the economic contributions of the Central Valley project to the economy of the State and Nation. In our previous correspondence we indicated that we felt that it was important in an area such as the Central Valley, where there was an established economy based on irrigation, to examine all facets of the irrigation economy and to attempt to relate this structure to the accomplishments of the project.

Because of limitations of time we have based the report exclusively on data available from existing sources. While we are sure that a better job could have been done had more time been available, this report provides probably as thorough coverage as could be assembled, recognizing the limitations of economic information. After several more years of operation when the Central Valley project is more fully at work, perhaps a more complete report could be prepared.

I should like to call to your attention the following significant facts brought out in the report.

The project, in 1953, provided over 1,500,000 acre-feet of water, which represented about 70 percent of the crop irrigation requirements of the 720,000 acres irrigated.

The value of the crops and livestock produced and attributable to project water in that year was estimated at $152 million, or 11.7 percent of all cash farm income in the valley.

This production provided employment for an estimated maximum of 39,500 workers on the project farms and associated processing, packing, and transportation activities and about 50,000 persons engaged in serving them in local communities of the project area.

The combined purchasing power from wages of the employees on the farms and in collateral industries that year reached an estimated $54 million and an additional $35 million of net income received by project farmers swelled the total to $90 million.

It is estimated that this provided a market, among other things, for $40 million in automobiles, $10 million in farm implements, $25 million for gasoline, $13 million in apparel, and $15 million in furniture, household equipment, and home appliances. It also

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resulted in Federal personal income tax payments of an estimated $7,300,000, 3 times the amount paid for project water in that year. The railroads hauled 21,800 cars of agricultural commodities attributable to project water to the rest of the Nation and 12,000 carloads of all merchandise from the rest of the Nation to the farmers and others benefiting from the project, for which they received an estimated $20 million in revenues.

Various staff representatives have participated significantly in the preparation of this report. However, Mr. Alex G. Nordholm of our Fresno operations field branch, who was detailed to this office, is to be credited in a large part for preparation of the report.

C. H. SPENCER.

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SUMMARY

This report attempts to assess the impact of the Central Valley project on the economy of the Central Valley and the Nation with particular reference to the year 1953. It does this by first portraying the general economy of the area and the relative importance, as compared with other industries, of the intensive irrigated agriculture which has developed and provided the base upon which the rest of the economy is built and a market for the Nation's output of manufactured goods. Against this background, the report attempts to delineate the particular contribution made by the lands irrigated with project water.

The following contributions to the economy of the valley and the Nation are estimated to be directly attributable to irrigation water furnished by the Central Valley project in 1953:

1. It provided over a million and a half acre-feet of water to irrigate almost 720,000 acres of land.
2. Cash farm income received from crops, livestock, and their products was $152 million, or 11.7 percent of all such income in the Central Valley.[1]
3. From 22,000 to 32,000 farm workers were employed, depending on the season.
4. From 5,300 to 7,500 workers were employed in processing, packing, and transporting project crops and livestock.
5. About 50,000 persons were employed in serving the farmers and workers in these collateral industries.
6. About $54 million was paid in wages and salaries to farm workers and those employed in collateral industries.
7. Farm owners received $35 million in net personal income.
8. The level of farm family living created in the project area is 50 percent greater than the average for the Nation.
9. The income received by project beneficiaries in the valley enabled the purchase of $40 million of new and used cars, $10 million in farm implements, $25 million for gasoline, $13 million for apparel, and $15 million for furniture, household equipment, and home appliances.
10. Railroads received revenues of $20 million for shipping 21,800 carloads of agricultural products to the markets of the Nation and and 12,000 carloads of merchandise to project farmers, those employed in collateral industries and those employed in serving both these groups.
11. Farmers and their employees paid an estimated $7,300,000 in Federal personal-income taxes, or 3 times the amount they paid for water. They also paid over $1,806,000 in State retail sales and personal-income taxes and paid $2 million more in property taxes to the counties than they would have without the project.

[1] Includes income from crops, livestock, and livestock products produced with project water only, and excludes cash income derived from the natural water supplies of the districts served.

12. About 500,000 acres of irrigated land which would have reverted to dry farmed land or native pasture without project water retained a market value of $212,750,000 more than they would have without project water, and over $60 million of value has been added to dry land that has been irrigated with project water since 1944.

13. Over $400 million was spent to plan and construct the project by the end of 1953. Of this $150 million went for contractors' payrolls, which was largely spent in the towns where construction took place and benefited local merchants and their national suppliers. About $280 million was spent for materials and equipment by the Federal Government and the contractors. Of the Federal Government's expenditures for cement, generators, turbines, pumps, and other materials, over $43,300,000 was spent mostly in the Middle Atlantic and Great Lakes regions. Over two-thirds of the contractors' expenditures for machinery and equipment and other materials, or about $100 million was spent in these regions and other Eastern and Southern States. These expenditures provided employment for thousands of factory, mine, and mill workers all over the Nation. Parts for the giant conveyor used to build Shasta Dam came from 14 States. Its belt, over 9.6 miles long, contained 1 million pounds of rubber and 1,000 bales of cotton and was made in Ohio. Its rollers came from Ohio and Wisconsin. Three new towns near Shasta Dam and one at Friant in Fresno County were born and are still thriving as a result of the project.

14. With all of the above effects of project irrigation in 1953, the initial features were supplying only 52 percent of the water they will ultimately serve in the valley. Under full operation of these facilities, the project's impact on the economy of the valley and the Nation should almost double the results outlined above for the year 1953.

15. Additional facilities now under construction or authorized or in final stages of planning will provide a water supply of 2,535,000 acre-feet to irrigate 911,000 acres in the valley, the cash farm income from which, it is estimated, will be $193,700,000. The effect of this will be comparable to adding another county with the economic potential of Fresno County. Its impact on the local and national economy would also be equal to or greater than that of the Central Valley project in 1953.

The impact of irrigation on the overall economy of the valley and the Nation may be sensed from the following facts:

1. Over 5 million acres of native pasture and dry farmed land have been transformed to land intensively farmed under irrigation. As a result, fruits, truck, field crops, and livestock worth $1.3 billion were produced in 1953, exceeding the production of every State except Texas, Iowa, and Illinois.

2. From 189,000 to 272,000 persons were employed on farms, depending on the season, which was twice as high a proportion of all employment as on the farms of the Nation as a whole. Wages and salaries paid to farm workers amounted to over $267 million. Their productivity per worker, as measured by cash farm income, was twice as great as the average for the Nation.

3. From 45,000 to 69,000 persons, depending on the season, were employed in the valley in processing, packing, and transporting agricultural products and received $200 million in wages and salaries.

4. Nine times as many workers were employed in agriculture as in the mining and lumbering industries, the second and third basic extractive industries in importance.

5. For every person employed in agriculture, and the associated processing and transportation activities and mining and lumber, two persons were employed in wholesaling, retailing, construction, servicing, and public administration.

6. Irrigated agriculture and associated industries have enabled the population of the area to grow at a more rapid rate than any other area of like size in the United States with an increase of 56 percent in the years 1940–50.

7. It has developed a per capita income for the valley of $1,797—higher than that of the Nation. Total personal income received in 1953 amounted to $3.5 billion. Twelve out of 18 counties in the valley were listed among the 100 leading counties in the United States in the value of farm products produced.

8. It has created a prosperous group of towns and cities in the valley. Local businessmen did a retail business of nearly $2.5 billion in 1953, providing a market for the Nation's factories, valued at retail, of $340 million for new and used cars, $128 million for household equipment, furniture, and home appliances, $172 million for apparel, $215 million for gasoline, and $86 million for farm implements, to mention just a few of the industries participating in this rural market.

9. Over $89 million in revenues were collected by the railroads for transporting about 186,000 cars of agricultural produce from the valley to the rest of the Nation, and over $83 million in revenues went to the railroads for moving 20 million tons in 100,000 carloads of all commodities needed by the people of the valley from the rest of the Nation. An estimated net revenue of $15 million to the railroads resulted.

10. Federal personal-income taxes of over $335 million were paid in the valley in 1951, the latest year for which returns are available. It is estimated that $62 million, or 18.6 percent, came directly from farm owners and workers in the valley.

THE CONTRIBUTION OF IRRIGATION AND THE CENTRAL VALLEY PROJECT TO THE ECONOMY OF THE AREA AND NATION

INTRODUCTION

Over half a century ago, the Congress, in passing the Reclamation Act, launched the Federal Government in the development of the water resources of the arid West in cooperation with the States and local interests. Since then much has been heard throughout the world of such engineering monuments as Hoover Dam on the Colorado River and Grand Coulee Dam on that titan of the Northwest, the Columbia, with their towering heights and impressive masses of concrete. Harnessing their waters to irrigate arid areas larger than some of our States while at the same time pouring out hydroelectric energy to help foster and sustain the phenomenal industrial growth in their regions, these and other Reclamation developments, not the least of which is the Central Valley project in California, constitute a striking testimony of the Nation's resourcefulness in applying advanced technology to developing farms and in building to high levels the standard of living of the farmers of the West and the millions who have migrated there seeking employment.

Not so well understood, however, are the fundamental income-generating capabilities of the more than 6 million acres of irrigated farming which have resulted from this engineering and construction and the far-reaching economic impact of this growth of farming and power development upon the local communities in the project areas and upon the economy of the rest of the Nation. It has, of course, been recognized that as the projects were built the expenditures for construction benefited local merchants as a result of wages earned and spent in their area and that generators purchased from Pittsburgh or pumps from New Jersey and a host of other materials purchased in almost every State in the Union were creating local employment in the areas of manufacture. However, while important, these expenditures represent but a small part of the total chain of income produced by the projects. The sum total of the local and national impact of this increase in basic farm income has not been measured quantitatively, nor is it very generally appreciated.

The Bureau of Reclamation, as required by law, has made studies to show that its projects were feasible in that the land to be irrigated had the economic capacity to repay the costs of construction when coupled with the revenues from power and sales of municipal and industrial water. The Bureau has also kept a continuous record for many years of the gross crop income derived from the lands served by project facilities and has made some studies showing rail shipments, Federal income-tax revenues, employment on farms and in

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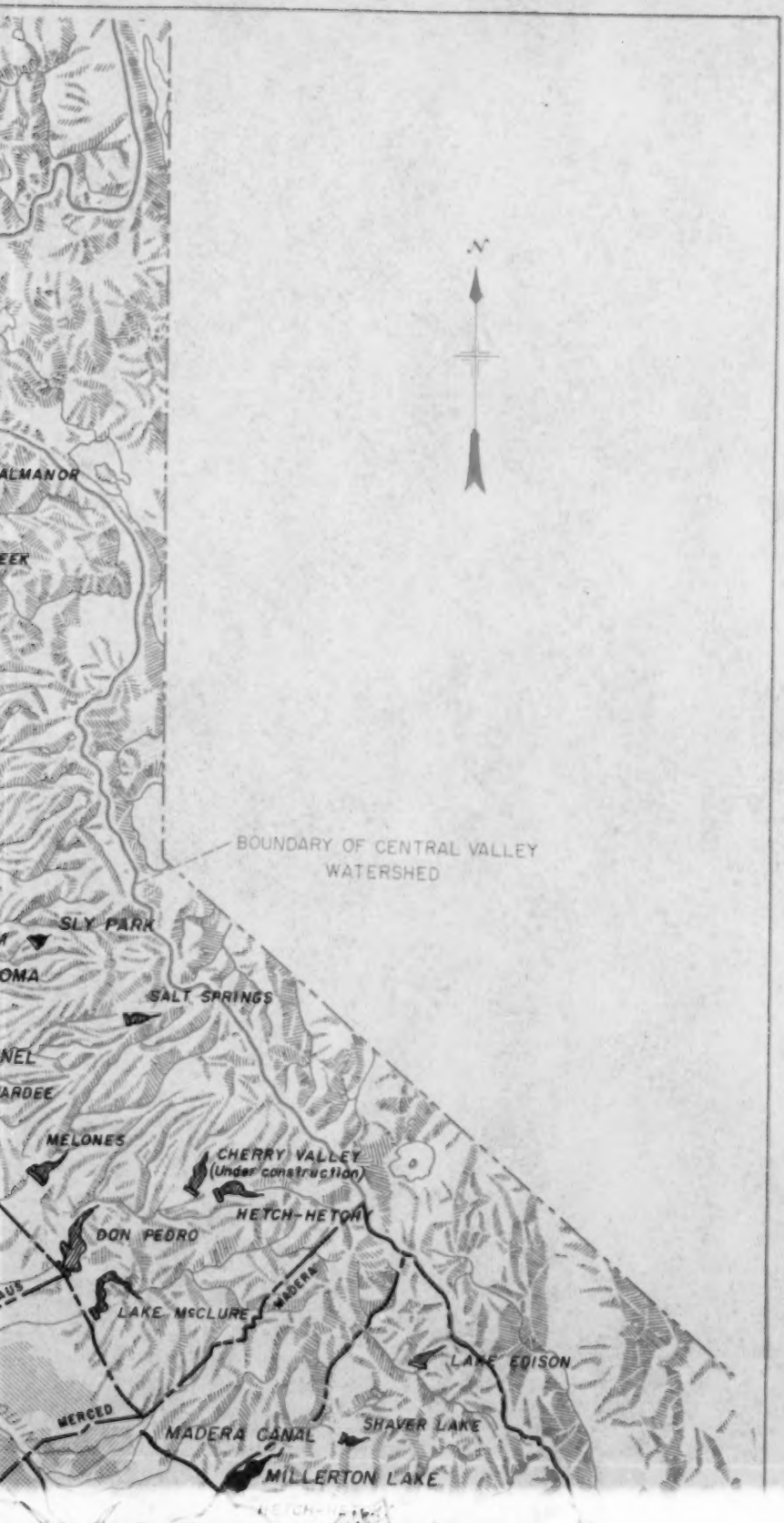
neighboring towns, growth of bank deposits and other data resulting from a few of its projects. But careful quantitative measurement of total project effects on the economy have been the exception rather than the rule. This report on the irrigation, power, recreation, and wildlife accomplishments of Central Valley project should aid in understanding the important economic contribution which Reclamation is making to the growth of the West and of our Nation.

In contrast to many Reclamation areas the Central Valley of California had a well-established history and a rich agricultural economy, much of it irrigated, developed solely by the ranchers and farmers and irrigation districts of the area long before the Federal Government undertook the construction of the Central Valley project. With the exception of the relatively small Orland project on the west side of the Sacramento Valley, no Federal development of irrigation works had been undertaken in the valley prior to 1935, the date of the first Federal appropriation for the Central Valley project. In addition to this agricultural development, considerable development has occurred in lumbering, mining, oil, and in agricultural processing and marketing based upon the abundant resources of the area, with a resultant growth of trade, transportation and other services needed by those engaged in these basic enterprises.

It was against this background of intensive agriculture, which had developed critical water shortages, particularly in the San Joaquin Valley, that the Central Valley project was planned and constructed. It was designed to put a firm water base under the existing agriculture by supplementing local supplies with water from northern California's Sacramento Valley and to provide new water for lands which had no local supply. Basically, this report will attempt to portray this established economy and irrigated agriculture's contribution to the growth of the local and national economy, and against this background to delineate the particular contribution of land irrigated, of recreation facilities and wildlife benefits created, and power produced by the project.

Four main areas of the economic influence of irrigation will be considered. Initially, the direct effect on farmer's income and level of living through intensive irrigated agriculture will be shown. The concomitant effect of this substantial increase in income and in the quantity of crops produced is to enlarge the local urban economy both in terms of processing, marketing, and transportation and to multiply the services provided to farmers and those engaged in these associated activities. This will be portrayed insofar as data are available. The contribution to the local and national economy of Federal expenditures for the actual construction of the project and by added tax revenues to the Federal Treasury derived from the expanded local economy will be taken into account. And, finally, the increased volume of processing, marketing, and transport of goods shipped into the area from the rest of the Nation as a result of the expanded local income will be examined. Since irrigated agriculture is the principal basic extractive industry, it is clear that the valley would support far less economic activity without irrigation. By dividing the economy into layers and considering benefits which accrue at each layer, the total impact of irrigation and the project becomes clearer.

SHASTA
SHASTA LAKE
KESWICK
REDDING
TEHAMA
LAKE ALMANO
BUTTE
BUCKS CREEK
SACRAMENTO CANALS
(Under construction)
GLENN
STONY GORGE
EAST PARK
SUTTER
YUBA
CLEAR LAKE
COLUSA
YOLO
FOLSOM
LAKE NATOMA
MONTICELLO
(Under construction)
SOLANO
SACRAMENTO
PUTAH SOUTH CANAL
(Under construction)
DELTA CROSS CHANNEL
SACRAMENTO
SAN JOAQUIN
PARDEE
CONTRA COSTA CANAL
STOCKTON
TRACY PUMPING PLANT
SAN FRANCISCO
SAN STANISLAUS
DELTA-MENDOTA CANAL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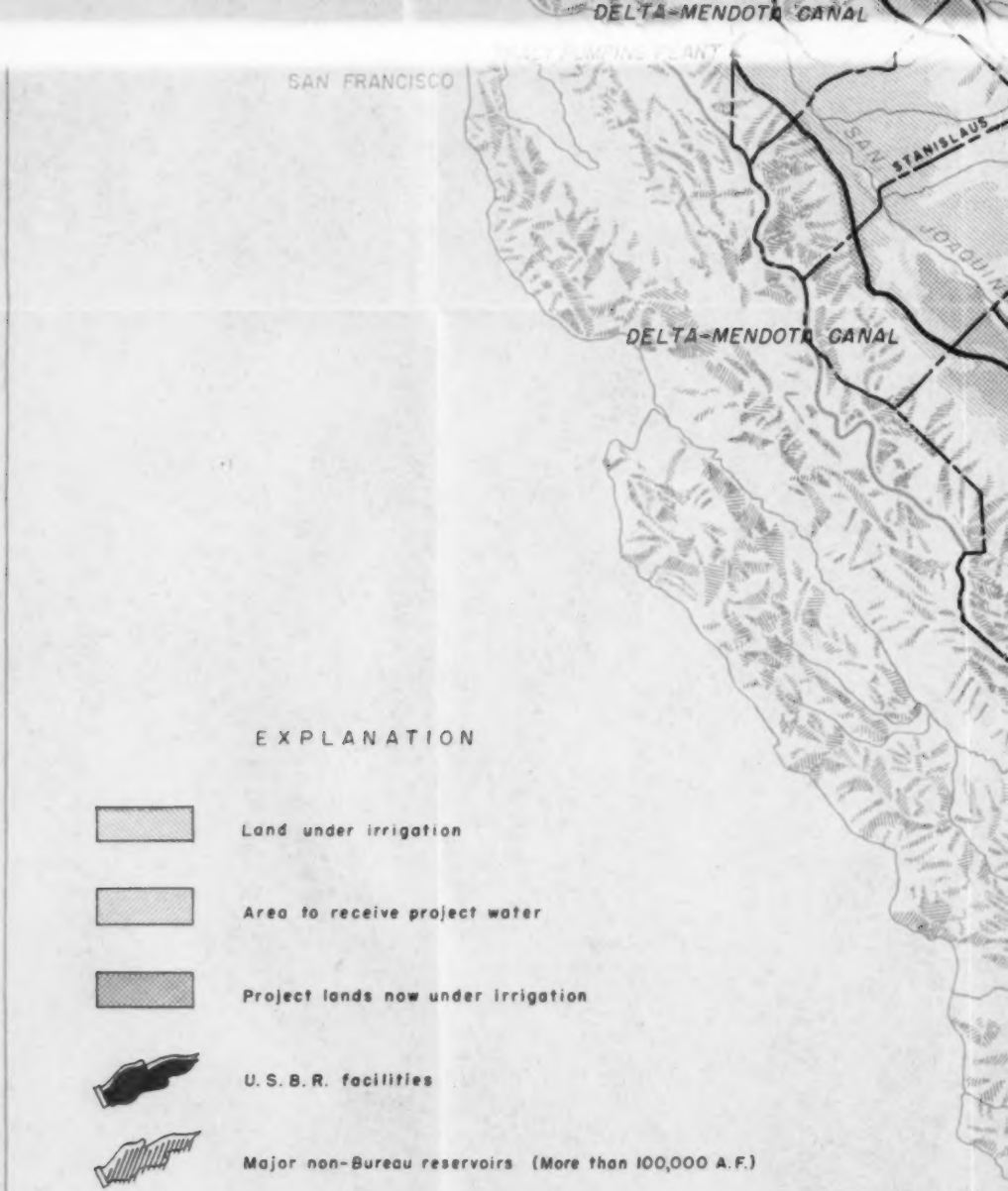
BOUNDARY OF CENTRAL VALLEY WATERSHED
SLY PARK
SALT SPRINGS
MELONES
CHERRY VALLEY (Under construction)
HETCH-HETCHY
DON PEDRO
LAKE McCLURE
MADERA
LAKE EDISON
MERCED
MADERA CANAL
SHAVER LAKE
MILLERTON LAKE



UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

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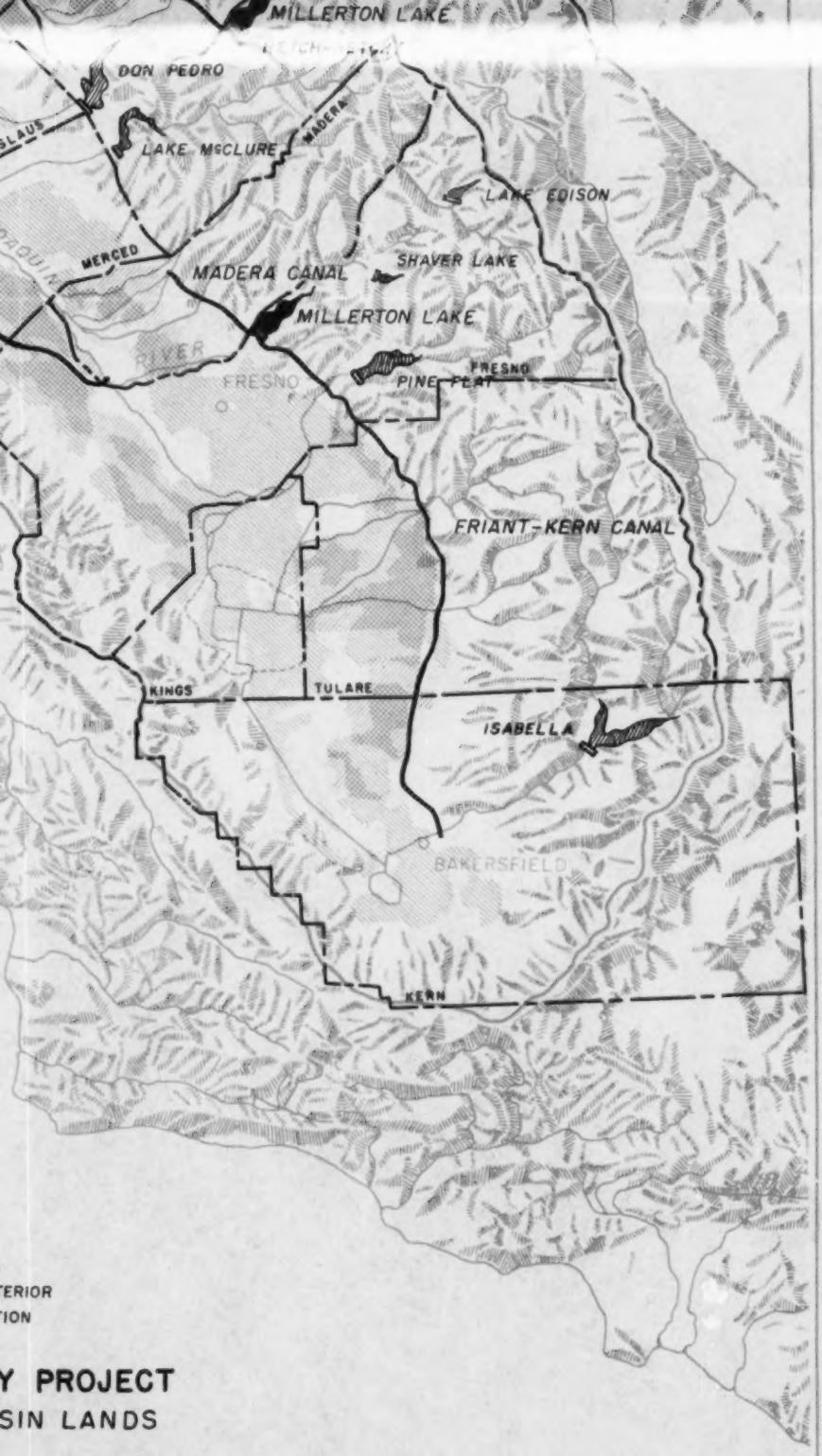

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PLATE 1

Some 18 valley floor counties in the project area have been included in the study and throughout this report where the terms Central Valley or valley floor counties or 18 counties are used they refer specifically to the following counties (see map—pl. 1):

San Joaquin Valley counties

Fresno	Merced
Kern	San Joaquin
Kings	Stanislaus
Madera	Tulare

Sacramento Valley counties

Butte	Sutter
Colusa	Tehama
Glenn	Solano
Sacramento	Yolo
Shasta	Yuba

While these counties are largely located on the Central Valley floor, they also include some foothill and mountain land to the east and west. They encompass 41,851 square miles, or 26,784,400 acres, an area almost as large as the State of Pennsylvania. The Central Valley comprises 2 distinct valleys, the San Joaquin and Sacramento Valleys, each of which is 250 miles long, varying from 40 to 60 miles in width. The San Joaquin Valley contains two-thirds of the irrigable land in the whole area.

EARLY DEVELOPMENT OF IRRIGATED AGRICULTURE

The early years when the Spanish dons, the American colonizers, and the 49'ers came to the Sacramento and San Joaquin Valleys about the middle of the last century they found substantial rivers, a broad fertile valley, and huge landlocked lakes in the southern valley. The flow of these rivers increased with heavy winter rains and especially during the spring snowmelts and the broad benches were excellent for dry-farmed wheat and pasture. The deltas of the Sacramento and San Joaquin Rivers had fertile peatlands which could grow nearly any crop when the river overflows could be kept off the land.

The miners went directly to the little-claimed foothills. In the late 1850's some of these foothill counties and most of the towns had more people in them than they have today. Some of the 49'ers had cows, and a few took time off from mining and raised grain and vegetables, since food, in many instances, was worth more than gold.

The Americans, such as John Sutter, Charles Weber, and Dr. John Marsh, who came before the gold rush, and the Spanish were granted huge estates because land was plentiful and markets far away. As the plows turned over the valley sod dry-farmed grain flourished. The natural pasture of the area supported large herds of cattle and horses. In the latter part of the 19th century there was generally more rainfall than has been experienced since the turn of the century, and during many years the dry-farmed crops did particularly well. In the hills to the west of the valley and in the Santa Clara and Sonoma Valleys farther west, there were substantial orchards and vineyards that were very successful without irrigation.

The use of water in California agriculture starts with the Spanish missions that were founded between 1776 and 1820. The padres'

knowledge of irrigation as practiced in their native country, Spain, and the experience they gained at the missions established in arid Baja California, prompted them to locate most of the Alta California Missions where water for irrigation was at hand. There in the mission gardens fruits, vegetables, and grain flourished with the beneficial application of water to the soil. Remnants of these early reservoirs and ditches are still in evidence almost two centuries later. They provide an important reminder to the American and European settlers who began arriving in California during the 1830's of the key to answers in agriculture in the arid valley climate.

In the San Joaquin Valley during the decades from 1850 to 1870, water was diverted without previous storage from the rivers and run through crude ditches by the large cattlemen who flood-irrigated hundreds of thousands of acres of pasture to provide feed in the dry summer and fall period. Crude dams of brush or sand bags served as diversion structures and were replaced annually at first. In the foothills of the Sierra Nevada on the east side of the valley water was acquired in some areas from abandoned mining ditches. The demand for food was acute and had been accelerated by the increasing population during and following the gold rush. In many places on the valley floor artesian wells, developed with little or no effort, often produced substantial flows of high-quality water and were used for domestic purposes, stock watering, and even limited irrigation. These early irrigators were mostly individual ranchers, although as early as 1856 a company was formed to irrigate wheat near Woodland in what is now Yolo County.

However, construction of larger irrigation works in the San Joaquin and Sacramento Valleys by land-development companies and cooperative colonies was well under way by the 1870's particularly in the vicinity of the Kings River around Fresno, Selma, and Kingsburg, and, to some extent, near Porterville and Visalia. Substantial wooden and stone diversion works were built in the rivers and miles of canals were scraped out by farmers with the use of horses and the "Fresno scraper," a tool developed for this purpose. After the passage of the Wright Act in 1887, public irrigation districts were formed. The Central Canal Co., predecessor of the Glenn-Colusa Irrigation District, built huge ditches carrying the summer flows of the river 50 miles or more. Rice, which takes from 6 to 9 acre-feet of water to make a crop, did very well, particularly in the Sacramento Valley, as did other grains. In the San Joaquin Valley wheat and barley at first and later figs, grapes, oranges, alfalfa, and other field crops as well as irrigated pasture provided the basis for the present intensive agriculture.

On most of the San Joaquin Valley rivers, however, the flow dwindled rapidly after June or July. By 1900, it became evident that storage was needed to sustain the number of acres then under irrigation. Dams and reservoirs were built on the Mokelumne, Stanislaus, and Merced Rivers in the 1920's. There, hydroelectric power, which was developed concurrently with the storage of water for irrigation, became a paying partner in the venture.

On the streams without storage facilities, the farmers were forced to sink wells and pump water for crops when the river flows ceased in midsummer. Even on many of the streams with storage facilities,

as the acreage under irrigation expanded, the storage facilities had to be supplemented by groundwater pumping, particularly in dry years when little or no water could be stored. The development of the gasoline engine in the 1890's and the availability of electricity in the period after 1900 permitted economical pumping from groundwater from considerable depths and made possible a rapid expansion of irrigated cropping. This extensive tapping of the groundwater both for domestic and municipal use and for agriculture resulted in a depletion of groundwater far in excess of annual replenishment by the streams. Groundwater tables were falling from 2 to 30 feet a year, depending on the location of the well, over most of the east side of the San Joaquin Valley by 1920. Plate 4 shows the growth of both irrigation and population in California from 1850 to 1950.

By the end of World War I it was obvious that both the northern and southern valleys needed more reservoirs to store water as did southern California. A means for transferring the surplus water supplies from the Sacramento Valley to the water-deficient San Joaquin Valley area was also needed. The legislature appropriated money for a series of studies which came to be known as the State water plan. Increased pumping by electricity, the population growth of the 1920's, and further expansion of irrigation joined with a series of dry years at the end of the 1920's and in the early 1930's, provided the needed impetus for the execution of the initial features of this plan. The legislature and the people of the State authorized the construction of the initial features of the Central Valley project in 1933. A revenue bond issue was also approved by the electorate to pay for construction. However, the depression of the early 1930's precluded sale of the bonds and the State then requested the Federal Government to construct the project. Construction by the Federal Government commenced in 1937, although World War II prevented full operation of the initial features of the project until 1951. Meanwhile, the water-supply situation became quite serious.

The gradual shift from dry-farming to irrigated crops, 1888 to 1953

In 1888 California planted 3 million acres of wheat with a production of 42 million bushels, and was the leading wheat-producing State in the Nation. Today wheat is a minor crop used mainly for livestock and poultry feeds, although a considerable dry-farmed acreage is now planted to barley. In 1900, California fruit and nut crops were grown on only 600,529 acres. These crops expanded to 1,600,000 acres in the State in 1930 and are still planted on over 1,400,000 acres today. At the turn of the century cotton was virtually unknown. In 1953, cotton accounted for 1,348,000 acres in California, of which only about 12 percent is served by Central Valley project water. Early and late potatoes were planted on about 100,000 acres. All truck crops in the State totaled over 600,000 acres in 1953. These crops, together with rice and alfalfa, have built a new agriculture based upon irrigation in California in the last half century. The significance of these valley-crop groups in the State's economy is shown in table 3, which shows that about 40 percent of the value of the State's production of fruits, vegetables, and livestock and all but 1,500 acres, or 99.6 percent, of the State's acreage of rice came from the valley counties in 1953.

THE PRESENT ECONOMY OF THE CENTRAL VALLEY

Favorable soils and climate

When viewed in its entirety there is probably no area in the United States more richly endowed than the Central Valley of California by climate, soil, mineral resources, and timber for the development of a thriving economy based on the production of food, fiber, and other basic materials required by the Nation. Nowhere else in the United States is there a larger body of first-class irrigable land suited to the production of a wider variety of crops. With an adequate water supply and the long, temperate, frost-free growing season, the fertile soils are capable of producing heavy yields of almost any crop one can mention. The second ranking county in the entire United States in value of farm products sold, in 1949, Fresno, lies in the very center of the San Joaquin Valley and 12 out of 18 of the counties in the Central Valley were included among the 100 leading counties in the United States in value of farm products sold. There are many wine grapes grown in the valley which are grown nowhere else in the United States, and a large part of the commercial output of California of many other fruits and vegetables, such as plums, olives, almonds, peaches, nectarines, figs, onions, Persian and honeydew melons originate in the Central Valley. Sixty-eight percent of all cantaloups raised in California originates in the valley. In 1953, about 400,000 acres were devoted to rice and 640,000 acres to alfalfa in the Central Valley.

The extent of irrigation

In 1954, there were about 5 million acres irrigated in the 18 valley-floor counties, nearly all of which had been placed under irrigation in the past 75 years. The 4.2 million acres irrigated in the valley in 1950 represented 16 percent of all land irrigated in the Nation. Of this total 3.5 million acres were irrigated cropland and accounted for 83 percent of all cropland harvested in the valley at that time. (See tables 1 and 2.) An additional 700,000 acres of pasture was also irrigated in 1950. Irrigated crops have supplanted dry-farming to a large extent, particularly as to value of crops produced. Even in the foothill areas on the east side of the valley, where rainfall is usually higher than on the valley floor, dry-farmed fruits and nuts are not as widely grown as in previous years because of the higher productivity of irrigated land nearby.

Value and amount of crops produced

Four crop groups, fruits and nuts, vegetables, cotton, and rice, together with beef cattle, milk, and poultry, account for 87 percent of the value of production in the valley. (See table 3.) The $1.3 billion of agricultural production in this area is greater than that in any other State except Texas, Iowa, and Illinois. It is more than all of the New England States combined. While other areas of the State, such as the coastal area around Los Angeles and San Diego as well as the Imperial Valley, produce a substantial volume and value of agricultural commodities, the Central Valley is the agricultural heartland of the State. About two-thirds of the irrigated cropland harvested in the State lies in the Central Valley and about half of the value of crop production comes from there. While there is much additional land which could produce irrigated crops in both the

Sacramento and the San Joaquin Valleys, further development in the San Joaquin Valley has been limited by the fact that while it has two-thirds of the cropland, it has only one-third of the water. Much more production can be expected there as more adequate water supplies become available.

About equal proportions of the cash farm income of the 2 valleys come from fruits and nuts, although the San Joaquin Valley produces 4 times as much as the Sacramento Valley in dollar value of these crops. Two-fifths of the value of the production of the Sacramento Valley is in cereal grains, largely in rice. A similar proportion of the San Joaquin Valley crop value comes from miscellaneous field crops, largely from potatoes and cotton. One-sixth of the value of all agricultural production of the San Joaquin Valley is derived from truck crops.

Table 4 shows the value and tonnage of the principal crops of the valley and the proportion of these crops that the valley contributes to the total United States production. As measured by value, the valley's production is a substantial proportion of United States production. Almost 14 percent of the vegetables raised in the United States come from the valley, many of which supply the winter demand. About 16 percent of all fruits and nuts raised in the United States originate in the 18-county area and almost a quarter of the total United States production of rice comes from this area. Over 10 percent of the cotton and seed produced in the United States comes from the Central Valley. However, only about 12 percent of the cotton raised in the valley was produced in districts served by the project. For some crops the proportion of United States production in the area is much greater. For example, 98.5 percent of the figs, 87 percent of the almonds, 83 percent of the olives, 64 percent of the grapes, and 35 percent of the asparagus raised in the United States comes from this area. About 18 percent of all the cantaloups produced in the United States also originate in the valley. (See also pl. 2.)

As a result of the tremendous productivity of irrigated agriculture in the Central Valley the cash farm income per agricultural worker in the valley of $6,894 is almost twice as great as that for the United States, and the cash farm income per capita of $4,145 is about three and a half times the per capita value for all United States farms. Table 5 shows the relative productivity of the area as compared with the State as a whole and the Nation as measured by cash farm income received per worker and per capita.

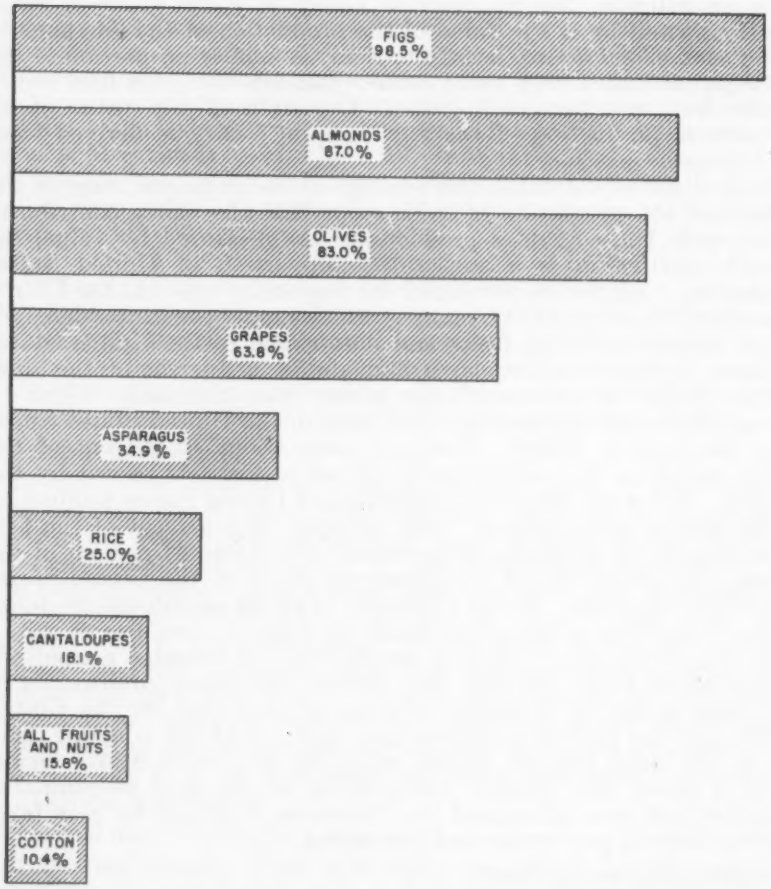
Rapid growth of population

The Central Valley, in common with many areas of the West, has been an area of rapid population growth in the past century. However, it has generally been growing at a rate comparable to the rest of California, which, for the past century has been the most rapidly growing State of the Nation.

Since 1860, when the population of the 18 valley counties was only 97,335 persons, the number of persons living in these counties has increased to 2,024,600. Since the turn of the century, with the exception of the post World War I and the depression years, their growth in population has approached or exceeded 50 percent each decade, and during this half century the rate of growth of the valley counties has been from 2 to 4 times as rapid as that of the average for

PLATE 2

PROPORTION OF UNITED STATES PRODUCTION OF SELECTED CROPS GROWN IN THE CENTRAL VALLEY AREA 1953 1/



1/ MEASURED IN GROSS CROP VALUE

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the Nation for various decades. During the period 1940–50, the growth in California was 53.3 percent and in the valley was 56 percent, exceeding that of any other State or area of comparable size in the Nation. Prior to 1930, the population of the State was increasing at a more rapid rate than in the Central Valley, but since then the situation has been reversed. Estimates indicate that this trend and relationship continued from 1930 right through to 1950. During the 5 years from 1950 to 1955, the valley population, of 2,024,600, grew at a rate of 3.1 percent per year, as compared with 4.5 percent for the State as a whole. By 1975, it is estimated that the population in the valley will be 3,090,600, or 52.7 percent greater than the figure for 1955. Table 6 shows the growth in population in the Central Valley since 1860 and the rates of increase for California and the United States.

This population growth, in large measure, has been the result of the growth in irrigation. Consistent with the trends in agriculture in the Nation as a whole, there would have been fewer people living on farms and employed in agriculture. However, this has not been true in the valley. While irrigated acreage increased about 42 percent from 1930 to 1953 in the valley, total agricultural employment has increased 44.7 percent and the farm population has increased by 18 percent. Even more impressive is the fact that total employment in the valley has almost doubled in the same period, largely as the result of the prosperity and growth of irrigated agriculture. (See table 7 and pl. 3.)

Actually, the growth of the population, income, and trade in the Central Valley has been much faster than the growth of irrigated acreage due, largely, to the vastly greater economic returns to the farmers from intensive irrigated agriculture, enabling more of them to enjoy a higher standard of living than they could under dry-farm conditions, and the economic importance of the collateral industries which has resulted from irrigated agriculture. Table 8 and plate 4 demonstrate the more rapid growth of population than of irrigated acreage.

Relative importance of valley industries

Employment on farms and in associated industries.—One measure of the relative importance of various industries in the Central Valley is employment. Since 1930, agriculture has employed more persons than any other industry. In April of 1953, about 189,000 persons or 26.5 percent of all workers were so employed, almost 3 times the proportion in the State and twice that of the Nation. Peak employment in agriculture in the valley rose to 273,000 in September during the harvest. In contrast, mining, which includes petroleum production, the second greatest extractive industry in terms of value of product produced, employed only 12,000 workers, or 1.7 percent of all employed in the Central Valley in April 1953. At that time, manufacturing employed about 66,000 persons, or 9 percent of all employment, which was less than half the proportion so employed in the State and less than a third of the proportion for the Nation, thus indicating the predominantly rural character of the valley economy. (See tables 9 and 10 and pl. 5.)

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PLATE 3

INCREASE IN IRRIGATED ACREAGE, EMPLOYMENT,
AND FARM POPULATION
CENTRAL VALLEY 1930 TO 1953

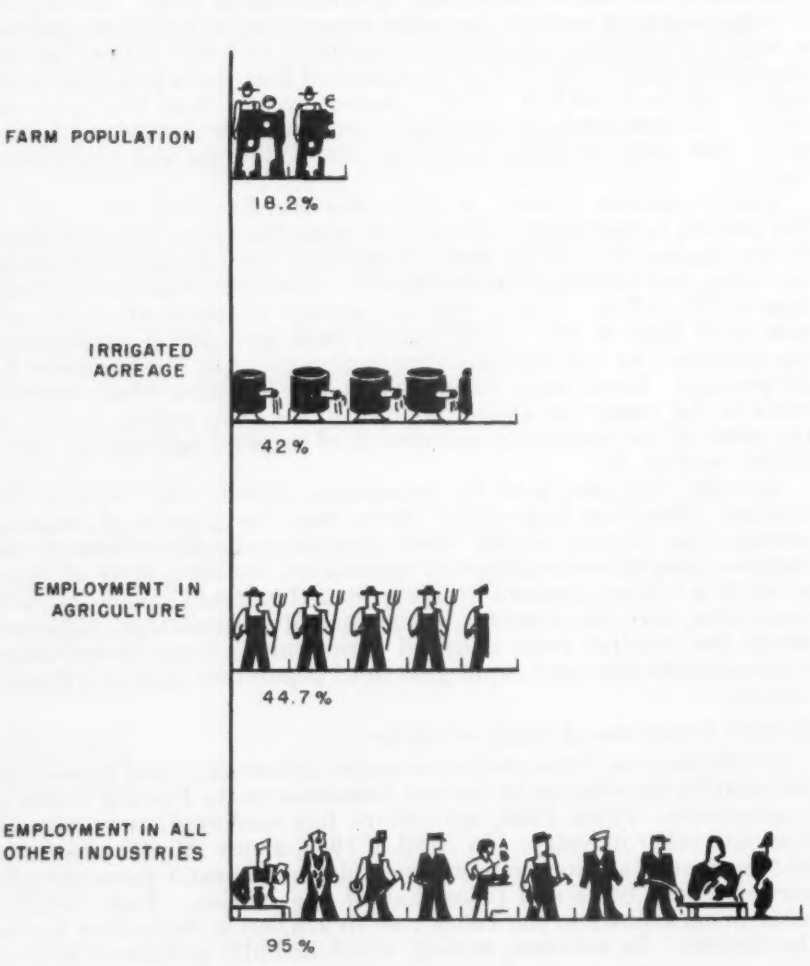

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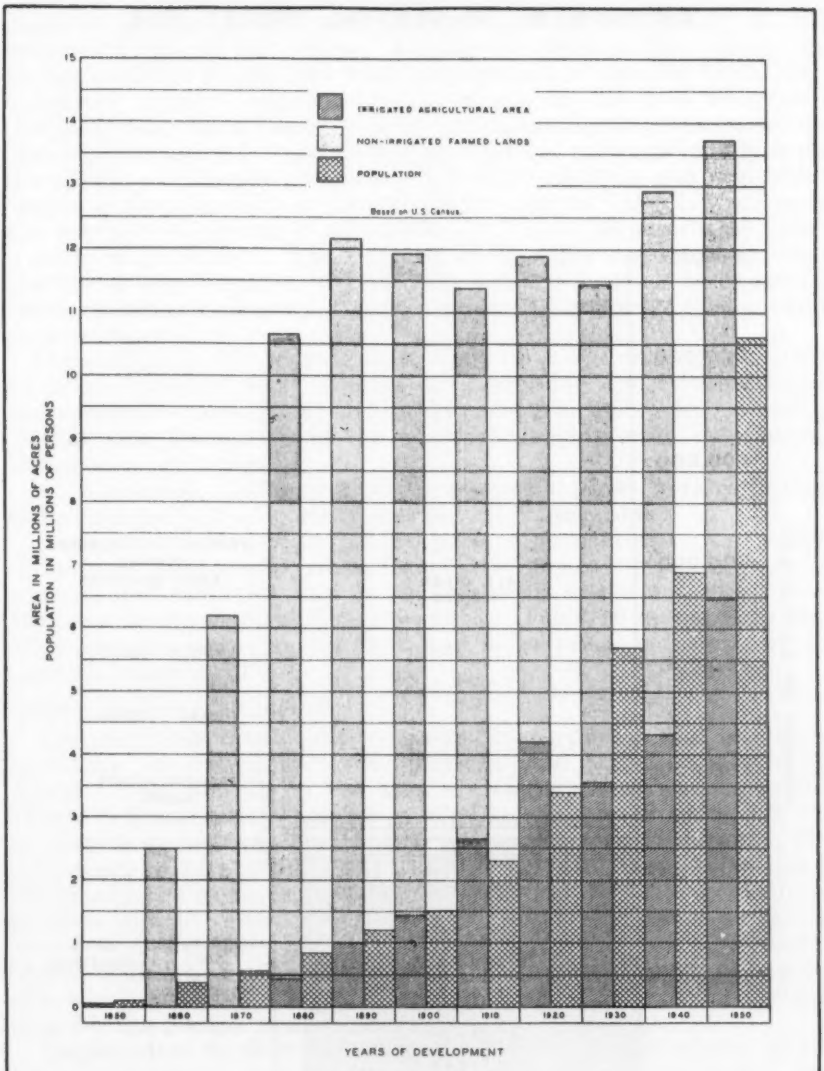
PLATE 4

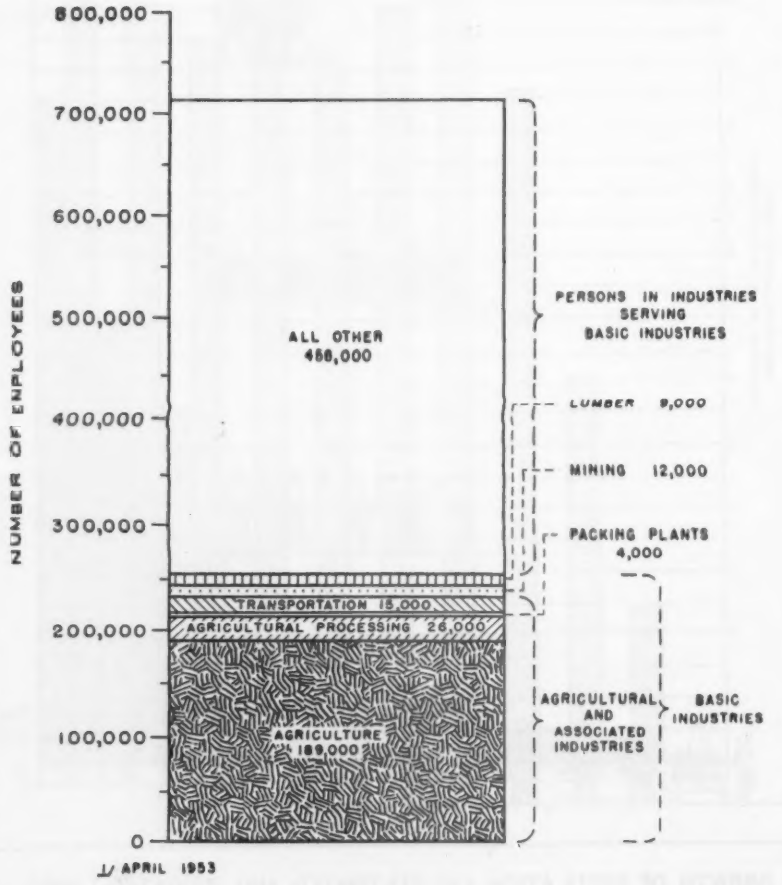


GROWTH OF POPULATION AND CULTIVATED AND IRRIGATED LANDS
OF CALIFORNIA

DIVISION OF WATER RESOURCES

PLATE 5

EMPLOYMENT 1/ IN CENTRAL VALLEY 1953



1/ APRIL 1953

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It is extremely important to note also that 25,700 of the 65,800 people employed in manufacturing, at the low point in the season, were engaged in processing food and kindred products originating on the irrigated farms of the valley. During the peak of the season the 25,700 swells to 41,300 and total employment in manufacturing also increases. Further, almost 12,000 persons in the San Francisco-Oakland area, which has little or no agricultural production, were engaged in processing food and other agricultural products largely from the valley. California cans nearly a third of all fruits and vegetables canned in the United States, mostly in the Central Valley. California also produces 85 percent of all wine in the Nation, 80 percent of which is made in the valley. The majority of the other employees in manufacturing were engaged in producing [articles such [as farm implements, printing and other articles consumed largely by farmers and those serving them.

Depending on the season, from 4,000 to 8,000 employees in the wholesale industry were engaged in assembling and packing fruits and vegetables and other agricultural products in 1953. In September of that year 35 percent of the wholesale employees in the Central Valley were so engaged.

An additional 15,000 to 20,000 transport workers were estimated to be engaged in transporting agricultural commodities.

In summary, 234,000 to 342,000 persons, depending on the season of the year, were employed on farms or in processing plants, such as wineries and canneries, and in packing sheds and transporting farm products in the Central Valley in 1953. Table 10 summarizes employment and wages on the farm and in collateral industries in the Central Valley in 1953.

Employment in other industries

The other important industry groups in the project area are transportation, construction, trade, services, and public employment. About 51,000 persons in the area are employed in transportation, 39,000 in construction, 142,000 in wholesale and retail trade, 128,000 in service industries, and 85,000 in public administration. The percentage of total employment that is found in these industries is practically the same as for the State and for the Nation. Only in services and in construction do the proportion of persons employed exceed that for the Nation. This probably reflects the extensive tourist trade which the valley enjoys and the rapid growth of population which has caused a proportionately greater demand for housing than for the Nation as a whole.

Employment in these industries depends to a large extent on the basic agricultural economy, with its collateral manufacturing and processing of farm products, and the other basic extractive industries of mining and lumbering. It is interesting to note that, for each person employed in these basic activities, two persons are engaged in transportation, construction, trade, services, and public administration in the project area. Table 11 shows employment in major industry groups in the project area as of April 1953.

Wages earned in basic extractive industries

Another measure of the relative importance of industries in the valley economy is the payroll. Agricultural workers on farms alone received $267 million in wages and salaries in 1953. The workers

engaged in processing, packing, and transporting agricultural products, while varying in number from 45,000 to 69,000 during the year, received a total of $200 million in wages and salaries.

In contrast, wages and salaries in the other basic extractive industries in the valley totaled $60 million in mining and $33 million in lumbering, in 1953.

PLATE 6

Agriculture, mining, and lumber as the base of the valley economy

All economic areas have a primary base, or combination of bases, to their economies upon which the superstructure of wholesale and retail trade, service industries, transportation, utilities, construction, and public administration is erected. In some areas this may be coal, copper, or steel; in others, manufacturing or lumbering, etc.

In the Central Valley the three basic industries upon which this superstructure appears to rest are agriculture, mining, including petroleum production, and lumbering. What, then, is the relative importance of these three basic activities to the valley economy? There can be little question as to the overwhelming significance of irrigated agriculture. Each year since 1946 it has produced crops and livestock valued at over a billion dollars. In 1953, this production was valued at over $1.3 billion. This was about 4 times the value of the petroleum produced, the second largest extractive industry in the valley, and 3 times the value of all minerals, including petroleum and products, which were produced in that year. Furthermore, agriculture's income is more widely distributed in the valley. The petroleum income is concentrated in only a few counties, and much of it goes to investors outside of the area. The value of lumber produced in 1953 is not readily available but, as indicated, and by the relatively small number of employees and the size of the total payroll for 1953, it was far less significant than mining as a base to the economy. Employment in agriculture was 15 times as great as in mining and almost 9 times as great as mining and lumbering together. Furthermore, it was fairly generally distributed over the entire Central Valley. Total wages and salaries paid in 1953 to agricultural workers were almost 5 times as great as the total paid to the employees of the mining industry and 8 times as great as the total paid in the lumber industry. It seems clear that without irrigated agriculture, the entire superstructure of industries in the valley dependent on this basic production would not have achieved its present growth and prosperity.

Income

One of the important results of the intensive irrigated farm economy found in the Central Valley is the high standard of living and ample purchasing power made available to residents of the area. This, naturally, results in a substantial local level of business activity and an active market for the products of the national industries. The level of personal income per capita is frequently used, along with others, as an indicator of these conditions.

In the 18 counties of the Central Valley, the total personal income in 1953 amounted to $3,509,234,000, or $1,797 per capita. While this is somewhat lower than the statewide average of $2,039 because of the relatively high income in the San Francisco Bay area and Los Angeles, it is substantially higher than the average for the Nation. California's average is higher than that of all but six States. Comparable data for the prewar year 1940 and for 1950 also indicate that the people in Central Valley have enjoyed a high level of living throughout this period.

The importance of irrigated agriculture in achieving this high income level can be seen from the fact that cash farm income, which measures gross farm business, represented 37 percent of all personal-

income payments received in the valley. In the Nation as a whole the comparable ratio is 13.2 percent.

About $2 billion of this income was received as wages and salaries. Another $718 million represented proprietor's net income and some $362 million was received as dividends, interest, and net rents. Other income received by residents of the area exceeded $232 million. About 63 percent of the total personal income in the Central Valley was received in the San Joaquin Valley counties. Significantly enough, these counties also contained about two-thirds of the irrigable land. Table 12 shows the income received in each category mentioned above for each of the counties in the Central Valley.

Federal income tax paid in Central Valley area

One of the important consequences of the wealth created by reclamation of arid lands has been the increase in Federal revenues from the wealth produced. For example, it has been estimated that in 1953 alone individual income taxes paid directly by irrigation farmers and by persons of the neighboring towns and villages, whose business or employment stem from the construction of 15 selected Reclamation projects throughout the West, amounted to $106 million.

Data are not available on Federal income taxes paid in the individual counties of the Central Valley. However, it is estimated that 14.5 percent of the State total of $2,320,749,000 paid in personal-income taxes in 1951, or $336,509,000, came from all persons in the area.[1] Of this, about $54,400,000, or 16.2 percent,[2] came directly from the farmers and farm workers.

State income and retail sales taxes paid in Central Valley area

In addition to the Federal taxes resulting from the irrigated agriculture, a considerable portion of the State's income tax and retail-sales taxes are derived from the farmers and farm workers in the valley.

With total income payments to all persons in the valley area of $3,504,234,000, taxable sales amounted to $2,076,483,000, or 59 percent of income, in the valley in 1953, and yielded $62,294,000 in State sales taxes.

Total income payments to farm owners and wages and salaries to farm workers in the valley amounted to about $569 million in that year. If this farm income produced comparable taxable retail sales, then some $335,710,000 in taxable retail sales may be attributed in 1953 to the farmers in the valley. At 3 percent, the rate of the State retail sales tax, they paid over $10 million in such taxes.

In 1953, over $12,113,000 were paid by persons in the Central Valley area in State personal income taxes, or almost 13 percent of all such taxes collected by California. Of this, about $1,964,000, or 16.2 percent, came directly from farmers and farm workers.[3]

Assessed value and property taxes paid to counties in the Central Valley area

As a result of the growth of irrigated farming and the other basic industries previously described in this report, as well as the industries serving those employed in these activities, the assessed value of prop-

[1] Based on proportions of State income taxes paid and the proportion of income for the State received in the Central Valley in 1951, the latest year for which data is available.

[2] Estimate based on ratio of income payments to agriculture to all other income payments in the Centra Valley.

[3] Based on ratio of income payments to agriculture to all income payments in the Central Valley area.

erty in the Central Valley area reached the enormous total of over $3 billion in 1953. Indicative of the essentially rural character of the economy is the fact that about $2,212 million, or 71 percent, of this property value fell outside of the corporate limits of cities and towns in the area.

Taxes and assessments by the counties and special districts within the counties on property both inside and outside of corporate limits amounted to about $149,700,000 in 1953. Of this, the county governments alone (excluding special districts) received $64,700,000 in general taxes on property, almost $46 million of which was collected from property owners outside of corporate limits of cities and towns in the area. The bulk of this $46 million came from farm properties. It would appear that an amount even greater than this was paid by property owners outside of corporate limits to special districts in the area.

Retail trade

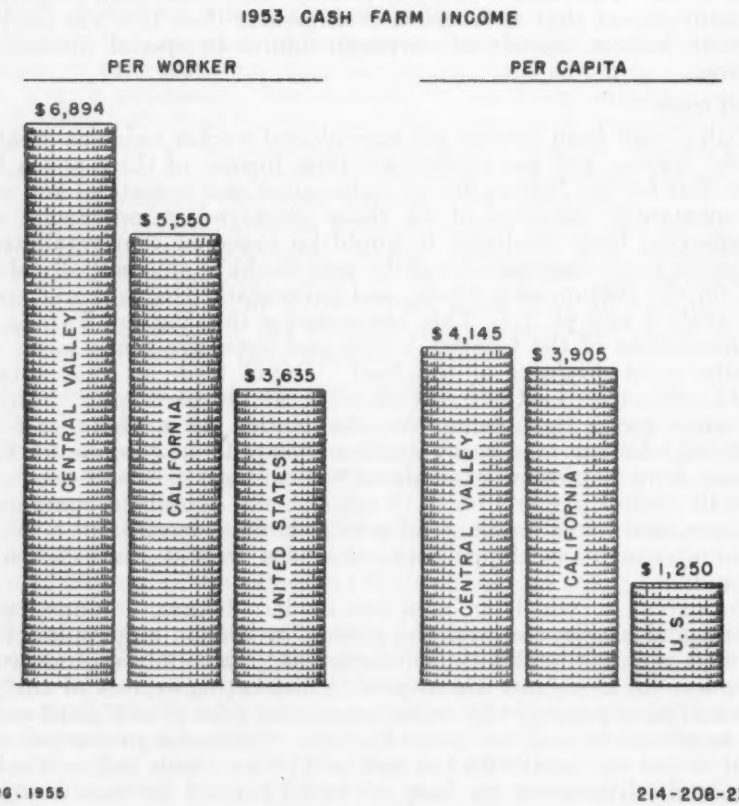
With a cash farm income per agricultural worker twice as great as for the Nation, and per capita cash farm income of three and a half times that for the Nation due to reclamation and irrigation, and with the substantial earnings of all those employed in processing and transporting farm products, it would be expected that retail trade per capita in the communities of the area would be substantially above that for the Nation as a whole, and particularly that of rural areas. (See table 5 and pl. 7.) This has meant a thriving retail trade for the merchants of the Central Valley and extensive markets for the manufactured products of the East. Retail trade in 1953 totaled $2,442 million in the Central Valley,[4] or $1,149 per capita. This is 7 percent above the average for the Nation as a whole. Of the nearly $2.5 billion, food accounted for $550 million; gasoline for $215 million; farm implements for about $86 million; new and used cars for $340 million; apparel for $112 million; and household equipment, furniture, and home appliances for $128 million, to cite but a few of the numerous items shipped into the area from factories all over the land.

The extent to which an area has modern homes, equipped with utilities and appliances, and the extent to which its population is provided with automobiles and telephones, is not only an indication of the level of living but is also used by marketing experts to analyze its potential as a market for replacement and sales of new products as they are developed. The Central Valley in 1950 had a greater percentage of homes equipped with hot and cold water, inside toilets, electric lights, and refrigerators, by from 2.5 to 9.1 percent for various items, than the Nation as a whole. Homes with telephones and cars per capita were also proportionately more numerous than for the Nation. Consumption of electricity in valley homes exceeded that for homes in the Nation by about 15 percent. This is reflected in the fact that of the 57,000 farms of the valley in 1950, 53,000 were electrified, 30,000 had telephones, 47,000 had electric water pumps, 11,460 had home freezers, and 10,716 milking machines. In addition there were 48,000 farm trucks, 63,000 tractors, and almost 5,000 combines. The extent of the market for new items and replacements is readily apparent. The overall level of farm family living in the Central

[4] Projected from the 1948 census of business.

PLATE 7

PRODUCTIVITY PER AGRICULTURE WORKER AND PER CAPITA IN CENTRAL VALLEY, CALIFORNIA, AND UNITED STATES



Valley in 1950 was about 50 percent higher than the average of farm family living in the Nation. Table 13 contains data to show the extent of installation or use of all of the above components of the high living standards in the Central Valley.

Carloadings and railroad revenues from farm products

The development of refrigerated railroad cars and reicing stations on the Nation's railroads has led to the distribution of Central Valley fruit and truck crops throughout the Nation. These products reach the Nation's tables year round in garden-fresh condition. Shipments of sugar beets, rice, alfalfa, grains, and cotton also run into thousands of cars annually. In all, about 186,000 cars of agricultural

products were shipped in 1953 to the Nation's markets over the vast railroad grid, resulting in revenues to the railroads of this Nation of over $89 million. It took 4,930 trains of average length to carry these crops. Placed end to end these trains would extend 1,580 miles, or approximately the distance from Fresno to Kansas City.[5] This volume of outgoing traffic and revenue could never have occurred had it not been for the extensive reclamation of the Central Valley's farmland. Table 14 shows the number of carloads shipped and the resulting revenues to the railroads for the major commodity groups in 1953.

Carloadings and rail revenues on products shipped into the Central Valley

Millions of tons of commodities from every State in the Nation are shipped into the Central Valley every year. In 1953, about 710,000 carloads of freight, weighing over 20 million tons, were shipped into California from other States. Only 61,100 of these cars carried agricultural commodities, mostly livestock and livestock products, feeds and grains. The balance consisted largely of manufactures from all over the Nation. This incoming traffic resulted in revenues to the Nation's railroads of about $557 million. About 15 percent, or 106,500 carloads of all commodities, were shipped into the Central Valley, producing revenues to the Nation's railroads of over $83 million in 1953.[6] The 106,500 carloads shipped into the valley constituted 2,823 trainloads of average length which placed end to end would extend from New York City to St. Louis, Mo., a distance of about 900 miles.

THE ECONOMIC IMPACT OF THE CENTRAL VALLEY PROJECT

The features and plan of operation

The Central Valley project, construction of whose initial features is now virtually completed by the Bureau of Reclamation, marks the beginning of a new phase in the development of the water resources of the Central Valley. Prior to the initiation of the Central Valley project, irrigation projects in the various parts of the valley had been developed independently of each other. Use of water, however, had reached a stage where any additional development of water use in one part of the valley affected existing and possible future development elsewhere.

The initial planning of the Central Valley project by the State of California and the subsequent modification of these plans and construction by the Bureau of Reclamation took full account of these multiple purposes and requirements of the project which include storage and transport of water for irrigation, generation, and transmission of hydroelectric power for project pumping of irrigation water and commercial sale, the prevention of disastrous floods, the improvement of navigation on the Sacramento River, the repulsion of salt-water intrusion to protect the rich lands in the delta of the San Joaquin and Sacramento Rivers, the conservation of fish and wildlife in the project area and the development of recreational facilities on the reservoirs of the project, wherever practicable.

[5] Based on average train length of 1,697 feet, and average carl ength of 45 feet.
[6] Based upon proportion of State taxable retail sales occurring in the valley.

The Central Valley project provides for Shasta Reservoir, a large storage facility with 4,500,000 acre-feet of capacity on the Sacramento River, just north of Redding. Water is released from Shasta Reservoir through Shasta Dam and powerplant and reregulated at Keswick Dam and powerplant for irrigation, municipal and industrial use, navigation, salinity repulsion, preservation of fish and wildlife, and power.

The irrigation water is used along the Sacramento River and in the delta. About a million acre-feet of water per annum is presently lifted 200 feet from the delta at Tracy by a huge pumping plant into the Delta-Mendota Canal. Power for this pumping comes from Shasta and Keswick powerhouses. The Delta-Mendota Canal carries the water by gravity flow 117 miles to Mendota pool, a point on the San Joaquin River 40 miles west of Fresno. There it replaces water formerly diverted by the farmers from that river into a series of canals flowing north to irrigate about 145,000 acres of valley land.

The major flow of the San Joaquin River is then stored behind Friant Dam in Millerton Lake, with 520,000 acre-feet of capacity, 21 miles northeast of Fresno. It is carried from there 37 miles north to Chowchilla via the Madera Canal and 153 miles south to the Kern River at Bakersfield, supplying water to lands on the east side of the San Joaquin Valley in Fresno, Tulare, and Kern Counties.

A smaller canal was constructed to carry water into eastern Contra Costa County for irrigation and for municipal and industrial use. This area is largely outside of the valley-floor counties.

A number of irrigation distribution systems have been constructed, or are now under construction, by the Bureau of Reclamation for various irrigation districts in the San Joaquin Valley which have contracted for water service from the project. These carry water from the project canals to the farmers' land.

These are the project facilities, along with power transmission facilities, now functioning in the Central Valley project area from which beneficial effects of the project water to the valley and national economy are now being created, and project benefits to the area will be limited in what follows as closely as possible to those derived from the water and power developed and transported by these dams, canals, powerplants, and other facilities.

Project water supplied and acreage irrigated in the Central Valley

Although the first Federal appropriations for construction of the Central Valley project were made in 1935, it was not until August 1951 that all of the basic facilities were complete and a fully integrated water service from Shasta Dam to Bakersfield, 500 miles to the south, could be inaugurated. In 1941, a small amount of water was delivered via the Contra Costa Canal. From 1944 on, water and power was made available to irrigation districts, municipalities, and the major power company in the area wherever separate features had been completed, or even partially completed, so that they could be used.

As we have seen, the war years had brought a dynamic surge of population to California and population in the valley had increased by 56 percent in the decade 1940–50. Pressure for food and fiber to win the war had caused heavy demands on the farmers and rapid expansion of irrigated area. They had drilled additional wells, quickly exhausted them and then drove down to deeper sources. They were mining the underground water supply, much of which had

lain under the valley since the glacial period, and which had become inadequate for the acreage which was being irrigated. Some areas had reached granite in their search for additional groundwater, and by 1948 well drillers in the San Joaquin Valley were seriously behind in meeting the demands for their skill. The farmers were losing the very basis of their livings, and the cities, industries, and enterprises dependent on their operations, faced the shrivelling of the base on which the existing economic structure was built. Driving as hard as it could to complete the major canals and pumping plant as well as the systems needed to get the water out to the farmers' headgates, the Central Valley project was none too soon in meeting the emergency which had developed by 1951.

Project-water deliveries, in the light of the emergency existing, were initiated in 1944 under temporary annual contracts for parts of the area covered by the several canals in the San Joaquin Valley as they were completed. Studies and negotiations looking toward long-term, permanent water service and distribution system contracts were carried on concurrently with construction of the features of the project. By 1953, more than 850,000 acre-feet of water was made available in the southern San Joaquin Valley from Friant Dam. Districts embracing 620,000 acres were served water and some 495,000 acres were irrigated. Ultimately it is expected that about 720,000 acres will be irrigated and an average of 1,400,000 acre-feet of water will be furnished districts in the Friant-Kern and Madera Canal service area.

Along the Delta-Mendota Canal some 134,000 acre-feet of irrigation water was furnished in 1953 to districts embracing almost 120,000 acres. With the completion of features like Folsom Dam and the Trinity River division, and reserving water for the service areas closely related, ultimately about 500,000 acre-feet of irrigation water will be provided in the Delta-Mendota service area to districts embracing 225,000 acres.

Along the Contra Costa Canal, which serves water outside of the Central Valley, 5,500 acres were irrigated with a supply of 4,300 acre-feet in 1953.

In 1953, about 989,000 acre-feet of water were being delivered to districts irrigating some 610,000 acres of land in the San Joaquin Valley. The project water delivered in that year represented 68.4 percent of the crop-irrigation requirements of the districts receiving the water. From 1948 through 1954 over 4,200,000 acre-feet of project water was delivered to land in the San Joaquin Valley. Deliveries for each year, acreage irrigated, total crop-irrigation requirements of these lands and the percent of these requirements taken care of by project water are all shown on table 15.

The Sacramento Valley canals on the east and west sides of that valley have been authorized by the Congress and construction is now under way. However, since 1944, the spring snowmelt of the Cascades has been stored in Shasta Reservoir and released later in the summer and fall months in accordance with irrigation, power, and other water requirements on the stream and in the project area. Between 1944 and 1953, annual diversions and rediversions by pumps for irrigation from the river and from canals diverting from the river in the area from Redding, near Shasta Dam, to Sacramento, have increased from 2 million to 2,600,000 acre-feet,[7] or about 30 percent. An additional

[7] A small percentage of these increased diversions may be attributed to other sources.

600,000 acre-feet of water came into use annually as a result of regulation provided by Shasta Dam and the acreage increase in the area due to favorable economic conditions.

During these same years the acreage in the Sacramento Valley served by these diversions increased from 348,000 acres in 1944 to 445,000 acres in 1953, or 28 percent. Some 97,000 additional acres were brought into production during these years, over half of which were planted to rice, a crop requiring from 6 to 9 acre-feet of water per acre per year. This additional production may be attributed in large measure to the project. Table 16 contains the historical data on acreage, diversions, and crops for the area served by Sacramento diversions from 1944 to 1953.

The future water supplies of constructed facilities and facilities now under construction or in final planning stage

The initial features of the Central Valley project which are operating supplied in 1953 only about 52.5 percent of their estimated ultimate water supply. Projects like Folsom and Nimbus Dams and powerplants and the Sly Park unit on the American River are just being completed. For the features already constructed to be fully effective, the Trinity division, authorized in 1955 by Congress, the Sacramento Valley canals, which are currently under construction, and the planned Folsom canals are also required.

Contribution of other Federal projects to water conservation and use

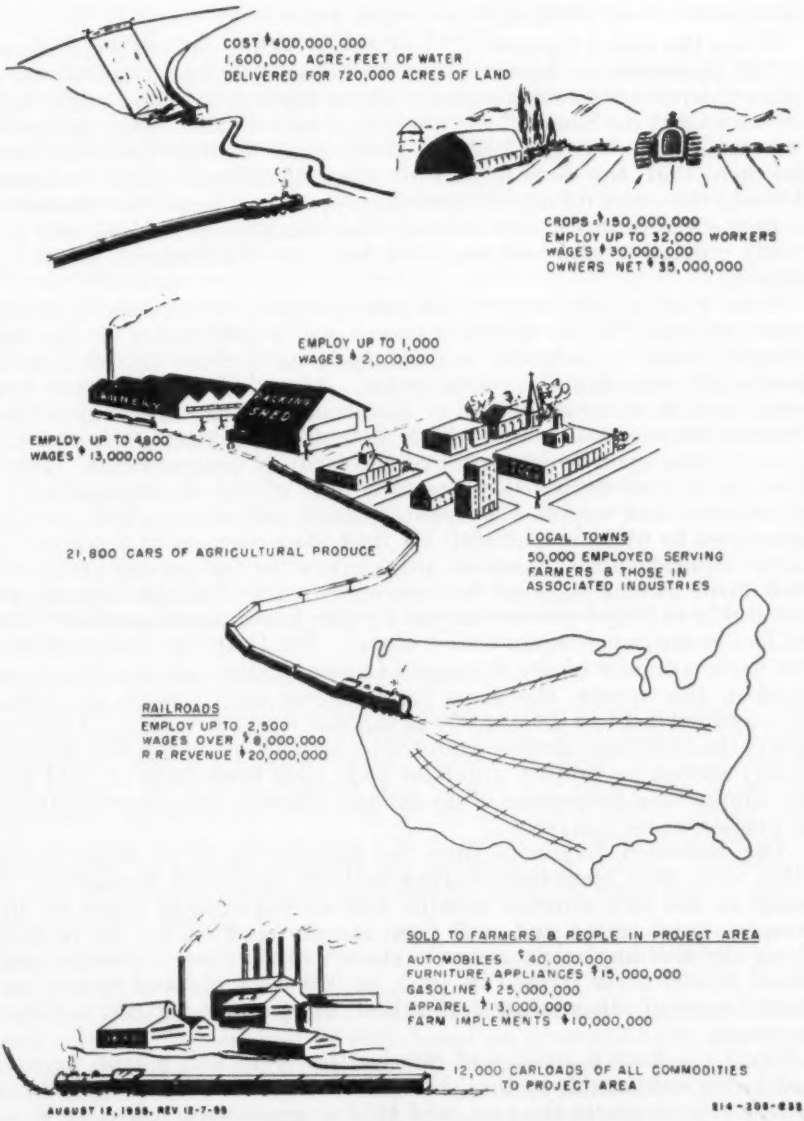
Monticello Reservoir, which will store 1,600,000 acre-feet, and will provide an average of 247,000 acre-feet a year to irrigate 96,000 acres and provide a municipal and industrial water supply in Solano County, is now under construction by the Bureau of Reclamation. The Orland project, with reservoirs storing 110,000 acre-feet and irrigating 20,000 acres, has been operating about 35 years. The Federal Government is also making a contribution to the irrigation economy of the valley through such recently completed projects as Pine Flat Dam and Reservoir (1 million acre-feet of storage capacity), and Isabella Dam and Reservoir (570,000 acre-feet of storage capacity). Allocation of cost studies show that a large part of the benefits of both can be attributed to the service they will render to irrigation. The Federal Government is also making some contribution for flood-control costs to the Tuolumne River developments of the city of San Francisco, such as Cherry Valley Dam, and to the Modesto and Turlock Irrigation Districts, by which the storage reservoirs on that stream will be enlarged and also operated for flood control. Projects such as the Merced County stream group and Dry Creek Reservoir in Fresno County also contribute to the local irrigation supply by retaining flood flows which are later partially percolated into the ground water. Thus, the ultimate water supply and acreage to be benefited will be much greater when all of these facilities are in full operation than they were in 1953. They will also contribute much to the expansion and improvement of the valley economy.

Present and future construction costs of the Central Valley project

Through December 31, 1953, the Federal Government had invested in excess of $400 million in the Central Valley project. Of this, $50 million of net power revenues from the project had already been returned to the Treasury. All of the $400 million cost but about $80

PLATE 8

CENTRAL VALLEY PROJECT AT WORK - 1953



million, which, as the cost for flood control and navigation is nonreimbursable, is to be returned to the Treasury by the water and power users. Ultimately, it is expected that $759 million will be invested in main-project features, including Folsom and Nimbus Dams and powerplants, the Sacramento Valley canals and the Trinity River division. If other features, such as the Folsom south canal and the San Luis division, are included, total project costs will exceed $1,006

million. It is estimated that an additional $196 million will be needed to build distribution systems in connection with the San Luis and Folsom south canals.

Cash farm income attributable to project water

When the initial features of the Central Valley project were placed in full operation in August 1951, California celebrated for 10 days. More than 20 communities up and down the length of the valley held ceremonies at the banks of the waterways and canals. They had good reasons. Gone was the fear of a great many farmers and local businessmen that the foundations of their livelihood might collapse. Already the water deliveries from the project had benefited thousands of farmers in both the San Joaquin and Sacramento Valleys, and the newly created wealth had begun to flow into the business life of the valleys.

From 1948 to 1954, over $1,087 million worth of crops and livestock were produced in the districts served by project water in the San Joaquin Valley.[8] It would be presumptuous to claim that this entire production was due to project water. Many of these districts had some natural-water supply from the streams in the area which they diverted where possible and which replenished, in part, each year the groundwater upon which many of the farmers' pumps relied. However, each year during this period a part of the crop-irrigation requirements was supplied by project-water deliveries, which in 1953 amounted to 68.4 percent and, by 1954, had risen to 72.3 percent of these requirements. Based on these ratios for the several years, the cash farm income received by farmers in these districts directly attributable to project water for the 7 years is estimated at about $608 million in the San Joaquin Valley alone. For 1953, the year for which the basic economy of the 18-county Central Valley area has been outlined in this report, the gross farm income attributable to project water amounted to $129,481,000 in the San Joaquin Valley. Table 17 shows the cash farm income received by all districts in the San Joaquin Valley served by project water for each year from 1948 to 1954 and the amount and proportion of this income which is directly attributable to project-water deliveries.

The increased diversions from the Sacramento River after Shasta Dam went into operation in 1944 and the increased availability of water in the late summer months had an appreciable effect on the acreage, crops raised and cash farm income received by the farmers along the Redding to Sacramento stretch of the river. Of the additional 97,000 acres farmed in 1953, 48,000 were planted to rice and 49,000 acres of other crops were raised, using about 600,000 acre-feet of water.

Using the known acreage of rice for that year and a crop pattern and yields comparable to that shown in the 1950 census of agriculture for the other crops in the area, and 1953 average State prices for these crops, it is estimated that a cash farm income for crops and livestock produced of $22,858,000 was received by the farmers of this 97,000 acres. Table 18 shows the details of this estimate.

For the year 1953, the total cash farm income received by farmers, directly attributable to project water, was $129,481,000 in the San

[8] Based on annual crop census made by the Bureau of Reclamation in cooperation with irrigation districts and an estimate of the value of livestock and livestock products produced in these districts.

Joaquin Valley and $22,858,000 in the Sacramento Valley, or a total of $152,339,000. This represented 11.7 percent of all cash farm income received in the Central Valley.

Employment in agriculture and associated manufacture and transportation directly attributable to project water

Assuming that employment in agriculture and associated industries in the areas receiving project water were comparable to that for the 18-county Central Valley area, and that they would be proportionate to cash farm income, from 22,000 to 32,000 persons, depending on the season, were employed in agriculture on farms as a result of the Central Valley project in 1953. An additional 3,000 to 4,800 were employed in processing agricultural products in canneries, wineries, gins, dairies, and other processing plants as a direct result of the project. From 500 to 1,000 were employed in packing sheds and assembly operations due to the project and from 1,800 to 2,500 were engaged in transportation of project crops. Thus, from 20,600 to 37,200 families were directly supported by employment in agricultural and collateral activities stemming from the fact that Central Valley project water was delivered to the water users in 1953.[9] In the communities in or near areas receiving project water this employment probably represented from a third to almost a half of all employment.

The analysis of the Central Valley as a whole shows that for each worker employed in the basic farming and collateral industries in 1953, there were two employed in retail, wholesale, service, construction and public administration. Thus it seems reasonable to assume that about 50,000 workers in these industries were engaged in serving those employed directly on farms and allied activities dependent on project water.

Wages and salaries attributable to project water

Based on the proportionate income and production stemming from project water in the areas supplied in 1953, over $30,500,000 was received in wages and salaries by workers on farms enjoying use of this water. Over $13,100,000 was earned by employees in plants processing agricultural products, $2,100,000 by workers assembling and packing fruits, vegetables, and other agricultural products, and $8,190,000 by those engaged in transporting them. Therefore, almost $54 million in wages and salaries resulted from just 1 year's project water service.

Net income of farm owners and collateral industries attributable to project water

In 1953, all farm owners in California enjoyed a net income of some $604 million. About half of this, based on proportionate cash farm income received, went to farmers in the Central Valley. On this basis, it seems reasonable to estimate that approximately $35 million, or 11.7 percent of the total income of farm proprietors in the Central Valley, was attributable to crops and livestock raised with project water. In addition, the owners of processing and assembly and packing plants and the railroads enjoyed a considerable net income directly from handling these agricultural products. It has been previously shown that the railroads received revenues from the trans-

[9] Based on 1.32 persons employed per family in the Central Valley as shown in United States Census of Population, 1950.

port of agricultural products in the Central Valley to the rest of the Nation of over $89 million, and of over $83 million transporting products shipped in to the farmers and others living in the Central Valley. Assuming traffic proportionate to cash farm income received as a result of project water, some $10,400,000 of freight revenues can be attributed to transport of products from lands getting the water and $9,700,000 from goods shipped into the area as a result of purchases by benefiting farmers and those serving them locally. If the railroads netted 5 percent of this volume of traffic, about $1 million of their net income may be attributed to traffic resulting from production dependent on project water.

No effort has been made to estimate net income to proprietors of processing and packing plants handling agricultural products, but this is undoubtedly greater than the amount received by the railroads, judging by relative employment and payroll in the several activities.

Increased purchasing power attributable to project

The total of wages, salaries, and proprietors net income derived from farms receiving project water and collateral industries, then, came to well over $90 million in the year 1953. This was available not only for food to supply the families of farmers, farm workers, and those employed in collateral processing activities, but also for the purchase of homes, apparel, cars, electrical appliances, farm machinery, drugs, and the whole panoply of consumer goods so largely imported into the area from the rest of the Nation.

Amount and type of retail sales attributable to the project

Taking a proportionate share of all retail sales in the Central Valley area, this basic purchasing power is estimated to have been responsible for expenditures in 1953 of about $40 million worth of new and used cars, $10 million for farm implements, about $13 million for apparel, $25 million for gasoline, and $15 million for furniture, household equipment, and home appliances. This is the market that reaches out all over the Nation from the project for goods to satisfy its needs.

Federal income tax paid by project farmers and their employees

The analysis of the Central Valley area showed that all farmers and farm workers in the area paid $62 million in Federal income taxes in 1953. If the Federal personal income taxes paid in that year by the farmers and farm workers on income attributable to project water was proportionate to the share of all cash farm income in the valley which that income represents, they paid over $6,400,000 in such taxes. This was almost two and one-half times as much as the $2,594,000 the farmers paid for project water in that year. Similar taxes were also paid by employers and workers in plants, processing agricultural products, in packing sheds and by transport employers and employees. However, no attempt has been made to estimate the amounts paid in income taxes by this benefiting group.

State retail-sales and personal-income taxes paid by farmers attributable to project water

In addition to the Federal income taxes paid by farmers and farm workers directly benefiting from the Central Valley project, State revenues from retail-sales taxes and personal-income taxes have been augmented by the income directly attributable to project water.

Farmers and farm workers received about $90 million in net income attributable to project water in 1953. This resulted in estimated taxable retail sales of over $53 million.[10] This volume of retail sales produced over $1,500,000 in revenues for the State.

Farmers and farm workers in the Central Valley area paid an estimated $1,964,000 in personal-income taxes to the State of California in 1953. Of this it is estimated that $306,000 was paid from income to these persons attributable to project water.[11]

Thus, in these 2 taxes alone the farmers and farm workers benefiting from the Central Valley paid the State $1,806,000 in 1953 or almost 70 percent of the amount they paid for project water in that year.

Carloadings and rail revenues attributable to the project

About 21,800 cars of agricultural products attributable to project water were shipped in 1953 from farms in the San Joaquin and Sacramento Valleys to the Nation's markets. They brought an estimated revenue of $10,400,000 to the railroad handling the traffic. Over 12,000 of these cars transported fruits and vegetables. The balance carried sugar beets, wheat, rice, barley, cotton, and other miscellaneous field crops. They constituted 578 trainloads of produce, which placed end to end would have extended 186 miles. Over 12,000 cars or 318 trainloads of manufactured and other products were shipped in from the rest of the Nation to supply the farmers and farm workers benefiting directly from project water, those in collateral industries and those serving them locally. Rail revenues on these incoming cars are estimated to have been about $9,700,000 in 1953.

Increased land values attributable to project

The guaranty of an adequate water supply for the lands in the districts in the San Joaquin Valley which have permanent contracts for project water has had a marked effect in increasing and sustaining land values in those districts. This has been most practically demonstrated by the change in the attitude of lending agencies toward the extension of long-term credit and farm mortgages to landowners in these districts. Prior to the signing of these contracts, most of the banks, insurance companies, and Federal farm loaning agencies were unwilling to make such loans to farmers in most of the districts. This attitude has completely changed since the contracts have been consummated. Long-term loans are now available in most of the area.

Studies of groundwater change in the Friant-Kern and Madera Canal service areas indicate that, for the 27 years between 1921 and 1948, an average of more than 500,000 acre-feet a year were pumped from groundwater for irrigation that were not replaced from natural sources of stream flow and precipitation. The average annual overdraft on groundwater for the years 1948–51, when irrigated acreage was rapidly expanding, increased to almost 1,160,000 acre-feet a year and in 1949 reached a high of 1,872,000 acre-feet. It was this rapid disappearance of groundwater supplies in the area which caused lending agencies to refuse to make long-term loans to farmers in the area. In an area where the average annual crop-irrigation requirement is 2.33 acre-feet per acre, at the average rate of overdraft which

[10] Ratio of taxable retail sales to income payments determined as 59 percent.
[11] Ratio of income payments attributable to Central Valley project to all farm-income payments in Central Valley area determined as 15.6 percent.

prevailed during the period 1948–51, almost 500,000 acres of irrigated land would ultimately have been forced out of irrigated production for lack of water.

In view of these conditions, it seems reasonable to assume that little or no additional land would have been irrigated in the districts served by the Friant-Kern and Madera Canals at that time had it not been for the certainty that sufficient project water would become available not only to stop this overdraft but also to provide for any additional acres which might be brought under irrigation. Between the years 1948–53, almost 50,000 acres of land that was dry-farmed in 1948 and over 15,500 acres of dry pastureland was placed under irrigation in the districts served by these canals under long-term contracts.[12]

During this same period, the average value per acre of irrigated land in the San Joaquin Valley was $600.50, of dry-farmed land $174.50, and of dry pasture $67.50.[13] Based on these values 500,000 acres, which would necessarily have reverted to dry-farmed land or native pasture, have been enabled due to project water to retain a market value as irrigated land of $212,750,000 more than would otherwise have been possible. The 65,500 acres of dry pasture and dry-farmed land which were newly irrigated appreciated in value by over $30 million due to the availability of project water and the investment of the farmers in land leveling and other irrigation facilities (sprinklers, pipe, etc.) required to bring the land under irrigated cultivation.

Some 97,000 acres in the Sacramento Valley which were dry-farmed or native pasture prior to 1944 were placed under irrigation largely because of the operation of the project by 1953. If we assume that the value of the 48,000 acres planted to rice in this area increased by $200 per acre and the 49,000 acres planted to other crops increased in value by $426 an acre, the actual difference between irrigated and dry-farm values in the San Joaquin Valley during this period, the 97,000 acres appreciated in value by some $30,474,000 due largely to the availability of project water and investment by the farmers in land leveling, pumps, farm ditches, etc.

These substantial increases in land values have undoubtedly provided a new base for agricultural credit which redounds to the general economic welfare of the farmers and the communities of the valley. At the same time, the valley has been spared what might have been, in the absence of project water, a serious decline in irrigated agriculture with a collateral decline in those industries and activities which rest on this agricultural base.

Effect of project water on county property-tax revenues

From the foregoing it can be seen that some $272 million in property values have been created and sustained as a result of the availability of project water. While the rates of assessed valuation of farm properties to current market values varies considerably from county to county, it seems fair to conclude that the assessed value of the property benefited by project water would total a third of the above value, or about $91 million. With an average property-tax rate of $2.169 per $100 of valuation in the Central Valley area and this assessed value, the counties in the area received about $2 million

[12] See table 19.
[13] See table 20.

in property-tax revenues, part of which was due to additional land brought under irrigation and part of which represented taxes of land being kept from going out of irrigated status by project water.

EFFECT OF GOVERNMENT EXPENDITURES FOR CONSTRUCTION OF THE PROJECT ON LOCAL BUSINESS AND NATIONAL INDUSTRY

Through December 31, 1953, the basic structures of the Central Valley project cost over $400 million of Federal funds to plan and construct, in addition to the amount spent by the State of California in early planning. This large amount was spent at varying rates over the period 1935–53. However, an average of $22 million a year were spent to build the project. These expenditures were of immediate and direct benefit to the contractors on the job and their employees and to the thousands of firms and their employees throughout the Nation which supplied the materials, equipment, and machinery used in building the dams, canals, and powerhouses, as well as the huge generators, turbines, pumps, drum gates, valves, instruments, and other equipment installed in the project features. They were also of immediate economic importance to the owners of rental properties in the vicinity of construction activities and to the merchants of the towns throughout the Central Valley in which the construction workers and Federal employees engaged in planning and construction lived. Today there are four new towns which came into being wholly as a result of the construction activity and have grown into permanent communities serving the needs of recreationists, tourists, and permanent employees engaged in project operation; namely, Central Valley, Project City, and Summit City near Shasta Dam and Friant, just below Friant Dam.

To trace the flow of these funds into the various economic arteries of the Nation and to their ultimate beneficiaries would be a major task in itself. However, the broader aspects of this stimulus to the economy of the valley and the rest of the Nation are not too difficult to see.

About a fourth of the expenditures went for materials of construction which were purchased directly by the Government through its procurement agencies. Three-fourths of the money was paid to private contractors who did the actual work of construction. About half of the contractors' share went for labor and services; the other half was expended for materials, construction equipment, and plant needed by the contractors to efficiently carry out their construction activities. Thus, the main channels through which the construction money was circulated throughout America were Government purchases and contractors' equipment and payrolls. The payrolls were rapidly converted to consumer demands supplied by factories and farms everywhere.

Where Federal expenditures for materials were made

From 1935 to 1955 the Federal Government spent directly about a fourth of all money appropriated for construction to buy materials and equipment used in the features of the project. These purchases were made in all regions of the Nation. A breakdown of these expenditures by area of purchase for the entire period of construction is not available. However, a large sample amounting to $131,772,613,

for which records were readily available, has been analyzed to determine the States in which the materials were purchased. Table 21 shows the distribution of these purchases by major geographical regions.

About 30 percent of the purchases were made in all but the 11 Western States, of which about 23 percent were in the Middle Atlantic and Great Lakes regions. Naturally, a considerable proportion of the purchases were made in the Pacific States adjacent to the construction sites, for bulky items such as lumber and cement are most economically handled by short hauls. Cement alone accounted for 13 percent of all procurement expenditures. Furthermore, many great national concerns maintain well-stocked depots in California and materials are purchased and paid for there, although they are fabricated in other areas. Many purchases for the project made in California were for tools made in New England, paint brushes made in New Jersey, electrical equipment made in Pennsylvania and Illinois, etc.

Contractors' expenditures

Over $300 million had been paid to contractors by December 31, 1953. A careful examination of their accounts revealed that about half of their charges, or at least $150 million was charged to machinery and plant, such as trucks, tractors, air tools, hoists, power shovels, grading equipment, railroad cars, handtools, conveyor systems, cement and aggregate machinery, and hundreds of other items necessary in large construction operations. Not all of these items were completely consumed in building the project; many pieces of equipment were brought to this project from other jobs and taken to still others when this one was completed. The costs shown usually allow a fair amount for depreciation incurred on the project. It is estimated that two-thirds or $100 million worth of equipment used was fabricated in all but 11 Western States, of which five-sixths was fabricated in the Middle Atlantic and Great Lakes States.

The great conveyor belt used in the construction of Shasta Dam, at the time the longest ever used in the world, is an example. It was 9.6 miles long and carried 1,100 tons of sand and gravel per hour. The belting alone contained about a million pounds of rubber and 1,000 bales of cotton. It was made in Ohio and, in operation, it moved over rollers made in Wisconsin and Ohio. In all, 14 States produced parts of this conveyor system, 10 of which were east of the Mississippi. Three of the seven 500-horsepower, 3-drum hoists and 3 of the cable carriages used in the construction of Shasta Dam were purchased new in New Jersey and 4 originated in the East, but were moved to Shasta from other jobs. The wire cable which lifted over 19 million tons of material on the job was also fabricated in the East.

Contractors' and suppliers' payrolls

Finally, the project's payroll dollar spread to innumerable corners of the American economy. The team of construction workers included engineers, skilled mechanics, clerks, power-shovel operators, truckdrivers, and many others, employed in the Central Valley itself. It also included industrial workers employed in Schenectady, Milwaukee, Pittsburgh, Detroit, Chicago, Birmingham, and a long list of other cities where parts of turbines, generators, transformers, cranes, and other machines are made and assembled. It included mill and

mine workers who helped provide the raw materials which were fabricated into these tools and engines and the men who operate our railroads and trucking industry. It is not too much to say that a portion of every dollar appropriated for Central Valley construction went to workers in every State of the Union.

By these purchases and expenditures, and through this construction effort, the American people were investing in their own future, for the Central Valley project is an instrument which will yield returns beyond our capacity for counting for many, many generations to come. Less solidly built irrigation systems in other parts of the world are still in use after 2,000 years, and, long after the original builders and original costs have been forgotten, are still the main foundations of life and civilization in the areas they serve.

ADDITIONAL IRRIGATION FACILITIES UNDER CONSTRUCTION OR UNDER ACTIVE CONSIDERATION BY CONGRESS AND THEIR POTENTIAL CONTRIBUTION TO THE VALLEY AND NATIONAL ECONOMY

The Sly Park and Sacramento Valley canals, units of the Central Valley project and the Solano project, are already under construction by the Bureau of Reclamation. The San Luis division, planned to bring additional water to the west side of the upper San Joaquin Valley, is already under active consideration for authorization by Congress, and the Folsom south canal planning report is completed and being circulated for State and local comment. A bill to authorize it has been introduced in the House of Representatives. The newly authorized Trinity River division will supply a large part of the water for the Sacramento Valley canals and provides increased water for irrigation along the Delta-Mendota Canal.

These additional irrigation facilities will ultimately provide 2,535,000 acre-feet of water for 911,000 acres of land in the Central Valley. The ultimate gross crop income anticipated from this land under project conditions is estimated at $193,700,000 per annum, at prices about 15 percent below current farm prices. This would more than double the economic benefits from the project which were estimated above for 1953. There were 836,335 acres of irrigated land in Fresno County in 1950 and probably over 900,000 acres in 1953. The cash farm income of that county for 1953 amounted to $230 million. Thus, the additional features described would have the effect of adding an additional county with the same amount of irrigated land and about the same farm income potential as Fresno County to the valley economy. Table 22 shows the acreages, water supply, and estimated cash farm income anticipated for each of these additions to the Central Valley's irrigation facilities.

MUNICIPAL AND INDUSTRIAL WATER

A part of the water produced by the project is furnished to communities and industries. At the foot of Shasta Dam there are three districts which serve water to the communities that grew up as a result of the construction activity and which now derive much of their livelihood from the recreational activity of the area. There is also a district at the foot of Friant Dam serving the town of Friant. The largest share of the municipal and industrial water served by the project is pumped into the Contra-Costa Canal and carried to the cities of Martinez, Antioch, and Pittsburg. It is also used by the

steel, oil, rubber, paper, and chemical industries of the area and supplements the supply of an existing private water utility. Gross revenues received from the sale of such water through 1953 amounted to $1,500,000.

POWER

Construction of Central Valley project powerplants and transmission lines, and sale of electric generation were authorized in 1937 "as a means of financially aiding" the basic undertaking of river regulation and reclamation of arid and semiarid lands, with the proviso:

> That the said dam and reservoirs shall be used, first, for river regulation, improvement of navigation, and flood control; second, for irrigation and domestic uses; and third, for power.

Power generation was started in June 1944, with an installation of 154,000 kilowatts at Shasta powerplant. By March 1950, the Shasta plant had been completed with a nameplate capacity of 379,000 kilowatts, and Keswick powerplant had been added with 75,000 kilowatts. During 1953, these two plants generated almost 2.5 billion kilowatt-hours, about 11.7 percent of the total generation in northern California, and in 1954 2.7 billion kilowatt-hours, or 12.7 percent of the total.

Three 230-kilovolt transmission lines extend 215 miles down the Sacramento Valley from the powerplants to the Tracy pumping plant, which requires 100,000 kilowatts for full operation, about a fourth of the above capacity. From Tracy a 69-kilovolt transmission line extends 41 miles to the Contra-Costa Canal, where 4 miles of 2.3-kilovolt lines convey power to four project pumping plants.

The energy generated is delivered directly to the project pumps and power customers via these project transmission lines and also through the transmission facilities of the Pacific Gas & Electric Co. Where no Federal transmission facilities exist, an arrangement has been made whereby power is delivered to some preference customers through the company's facilities for which service the company is reimbursed.

Project power was sold in 1953 to Federal and State agencies, irrigation districts, a public-utility district, a rural electrification cooperative, and a reclamation district, all of whom are entitled to preference with respect to project power. All power not delivered to these agencies, or used for project pumping was sold to the Pacific Gas & Electric Co. at an average rate of 4.05 mills per kilowatt-hour in 1953. Among the Federal agencies benefiting from project power were the Federal Bureau of Mines, 5 bases and camps of the Department of the Air Force, 3 facilities of the Department of the Army, 4 facilities of the Department of the Navy, and Ames Laboratory, operated by the National Advisory Committee for Aeronautics. State agencies receiving project power were Deuel Vocational Institute and Folsom State Prison. Irrigation districts receiving project power were the Glenn-Colusa Irrigation District, West Side Irrigation District, and Provident Irrigation District. In addition, by 1954, the Sacramento Municipal Utility District, serving the city of Sacramento and environs, and the Shasta Dam Area Public Utility District received project power.

After provision for operation and maintenance expenses, including a sinking-fund annuity for future replacements, and an interest charge

of 3 percent on the unamortized investment assigned to surplus power, the net available from fiscal year 1955 power sales totaled $4,403,948. The 1944–55 fiscal year total was $55,331,181, which represents 56 percent of the investment assigned for repayment from commercial power revenues.

It is estimated that by the year 1989 the $264,273,000 investment assigned to commercial power, including the Trinity division now under construction, will be retired, and that by 2002 net power revenues will have also retired the $116,282,800 of irrigation costs assigned for power revenue repayments. An unencumbered net power revenue of over $9 million a year will then be available as general receipts to the Federal Treasury.

The project's principal commitment for the sale of power is a 40-year contract with the Sacramento Municipal Utility District for service up to 290,000 kilowatts. Total sales of energy by the district to all activities in 1953 were 659,664,000 kilowatt-hours. Considerable savings in power costs were passed on to its residential consumers in the year 1953. In that year, the average residential consumer of the Sacramento Municipal Utility District used 2,495 kilowatt-hours of energy. Usage in comparable Central Valley cities served by the private utility was 1,654 kilowatt-hours in Stockton, and 1,919 kilowatt-hours in Fresno. The Sacramento consumers actually used on the average 30 to 50 percent more energy. On January 1, 1955, the monthly rate to Sacramento residential customers was $4.69 for 250 kilowatt-hours of energy. Rates in Stockton and Fresno for comparable quantities of energy were $6.78, or about 46 percent higher.[14] Estimates indicate that the district saved approximately 25 percent in its cost of energy under the new Federal contract over the previous arrangements. These large consumer savings were, therefore, the result partly of the low wholesale cost of energy supplied to the district by the project and partly of the lower cost of operation of the district.

Comparable savings are made possible to the Federal agencies who purchase project power. For example, these agencies paid a total of $1,433,000 for project power in 1954. At private-utility rates prevalent in their areas, the same energy would have cost them $2,090,000. An annual saving in energy costs of $637,000, or 30 percent, was made possible for 1954. Savings for other preference customers have attained similar proportions.

In addition to providing energy for project pumping and preference customers, 1,543,671,000 kilowatt-hours of project energy was delivered in 1954 to the private utility serving most of northern California at an average rate of 3.32 mills per kilowatt-hour. The large project hydroelectric plants integrated with the other steam and hydro plants of the utility because of their size have been of considerable assistance to the utility in its day-to-day problem of meeting loads and stablizing its system. Further, the additional energy produced by the project has been of considerable assistance to the utility in meeting the rapidly increasing demand for energy during the latter part of World War II and during the postwar years in its service area. The surplus energy available to the private utility will, of course, diminish as the energy requirements of project pumping and preference customers served by the project increase in future years.

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[14] Source: Typical Electric Bills, 1955, Cities of 50,000 Population and More, Federal Power Commission, FPC–R–50.

The electric energy produced by the Central Valley project has undoubtedly played an important part in meeting the postwar demand from the rapidly growing population, commerce, industry, and agricultural production of northern California. It has brought project water to the areas where it is needed, and provided a quarter of the energy needed by the farmers of northern California to pump groundwater, operate their farm and home appliances, as well as for the industries and residents of that part of the State.

The 454,000 kilowatts of installed capacity at Shasta Dam and Keswick Dam are capable of supplying equivalent energy to a nonindustrial community of 748,000, or an industrial city of over 560,000 persons. At the average rate of energy used per industrial worker in the United States, it would sustain industries employing 20,410 workers. With the 175,500 kilowatts of capacity at Folsom and Nimbus Dams, and with 233,000 kilowatts of capacity from the authorized Trinity River division, the project capacity will be almost doubled.

RECREATION AND FISH AND WILDLIFE

Over and above the irrigated crops and the energy produced by its powerplants the Central Valley project is paying substantial dividends in terms of recreation and the State's commercial fisheries, as well as in the annual noncommercial harvest of fish and wildfowl. Hundreds of thousands annually seek the reservoirs and their shorelands for boating, swimming, water skiing, angling, picnicking, and camping. Numerous resorts and several cabin colonies have been established, particularly at Shasta Lake; and Shasta and Friant Dams themselves have become two of the major tourist attractions in the Central Valley. Thousands enjoy the Sacramento River because of the regulated flows which improve angling and boating. An average of 500,000 annually visit Millerton Lake formed by Friant Dam; more than 250,000 are counted each year at Shasta Dam and Shasta Lake; and, certainly, an additional 250,000 now seek recreation along the Sacramento River. Of these groups, about 75,000 are out-of-State people who come to enjoy and utilize these facilities.

By its very nature the value of recreation cannot be measured solely in terms of dollars; but, if it is assumed that the 75,000 out-of-State visitors spend an extra day in the State, they leave at least $450,000 each year in the tills of those furnishing lodgings, meals, auto service, souvenirs, etc. But the major business, by far, is generated by demands of the resident population, which buys or rents boats, motors, cabins, clothing, fishing gear, etc. There is no way to separate from present overall totals of these expenditures the amounts which the project generates or to calculate differences between the overall totals and the amounts which would now be spent if the project had not been built. However, Shasta and Millerton Lakes are major water areas, and these with an improved Sacramento River no doubt account for a significant proportion. It is known that the number of local dealers handling boats and water equipment increased rapidly after Friant Dam went into operation. Several thousand boat permits have been issued to persons using these reservoirs. Most of the local people trail their boats to the lakes when they wish to fish or go boating. Nevertheless, the total value of boats moored in Millerton Lake was found in a recent survey to be $250,000, which probably represents

less than 10 percent of the total investment of boatowners. In addition, fishermen spent thousands of dollars for rods, reels, artificial lures, gasoline and sundry equipment, as well as money for boat hire, bait, fishing licenses, etc. If all the business thus generated plus the value of recreation to the individual recreationists is lumped to give a visitor-day of recreation a value of only $2, the total recreational value created is $2 million annually.

In cooperation with the State department of fish and game and the United States Fish and Wildlife Service, steps have been taken to conserve the fishery and to improve the habitat for waterfowl in the project area. Fish traps have been provided at Keswick Dam to recover steelhead and salmon in the headwaters of the Sacramento River and a fish hatchery has been constructed at Coleman Station near Anderson, Calif., to compensate for any damage to the fishery caused by the project. Fish screens have been installed to prevent loss of fish at the Tracy pumping plant. Cool water is provided from Friant Dam for a State trout hatchery in a section of the State in which water conditions suitable for rearing trout do not exist naturally. When all project fish-protection facilities are completed their capital cost will total about $5 million.

Some 30,000 acres of water surface have been added by the project to the inland angling waters of the valley and, in addition, the ocean salmon fishery dependent on fish spawned in Central Valley streams has been significantly increased. The average annual commercial salmon catch attributable to Central Valley streams is larger now than it was for a decade before project construction while the ocean sports fishery has increased, both in participants and in catch, by more than 100 percent since the project was built.[15] At least 20 percent of the total value ($1,500,000) [15] of the commercial salmon catch, or $300,000, may be attributed to the operation of Shasta Dam while half of the $7 million [15] value given to the ocean sports fishery may be so assigned. In addition a steelhead trout fishery estimated to have an annual value of $1 million [15] has been established, largely by reason of Shasta Dam operation and the operation of Coleman Hatchery, a project-built facility. Assigning the reservoir fisheries an annual value of only $200,000, it is reasonable to say that annual fishery values of at least $5 million have been created. Thus capital costs may be considered offset by returns in a single year's time, while annual operation and maintenance amounting to $300,000 per year may be considered covered by the range of error in calculating the annual return

Project water has also been delivered to wildlife-management-areas operated by the State department of fish and game. The water has been used both to provide a resting place for the annual migration of ducks, geese, and other birds from Canada to Mexico and back, and to irrigate feed for this vast migration to prevent the depredation on the farmers crops in the valley, which has caused loss running into many thousands of dollars annually in years past.

The annual harvest of wild birds in the valley is tremendous, and the expenditures by hunters for guns, ammunition, special clothing, duck decoys, blinds, gun-club fees, and other purposes in the pursuit of their sport are substantial. In addition, many hunters travel long

[15] Fish and Wildlife, appendix C, of the report to the Water Project Authority of the State of California on the Feasibility of Construction by the State of Barriers in the San Francisco Bay System. Department of Public Works, State of California, pp. 17–19, June 1955.

distances to hunt, involving expenditures for travel, lodging, meals, gasoline, tires, and other expenses. These expenditures create a sustained market in the valley and in areas like San Francisco and Los Angeles, from which many of the hunters come for such equipment, for hotel and motel accommodations in the valley and for the resulting business enjoyed by bus, railroad, and other service industries. For the past 3 years the project has provided from 25,000 to 35,000 acre-feet of water annually to the association representing the duck and gun clubs of the area and, in 1955, over 8,000 acre-feet to the State fish and game commission for use on its wildfowl resting and feeding areas. This water was delivered largely in the fall and winter of the year when, previously, only uncertain rainfall was available. Without this project water, it seems fair to say the hunters' expenditures in the valley wildfowl area would have been reduced to a fraction of their present size.

Increase in cropped acreages in the districts served by project water has improved habitat for pheasants, doves, and other field birds by providing feed and cover for these birds. The extensions of canals and distribution systems has improved cover and feed along the banks. In many places this has meant better hunting and, consequently, sustained markets for hunters' requirements sold by the valley's merchants.

Much has been made of a supposed adverse effect of the project on waterfowl habitat. Yet, after more than a decade of project operation, all the areas watered under pre-project conditions are still receiving water and receiving it from storage when it is needed rather than depending on the whims of rainfall as they did before. Decreases in habitat have occurred but they have been due to conversion of lands by their owners to uses offering higher economic returns. Most of the habitat where hunters may harvest the birds is in private ownership as duck clubs, closed to the public. Due to an agreement between the Bureau of Reclamation and the fish and wildlife service of the State, the public has gained a supervised shooting area of some 2,800 acres on a project wasteway and holding reservoir, a use incidental to this primary purpose. The availability of this land has precluded the necessity of State purchase of equivalent public shooting grounds. A Federal waterfowl area in Merced County, smaller in area, was recently purchased for over $500,000.

The foregoing represents only samples of the many ways in which the economy of the valley and the Nation have been sustained by the recreation and fish and wildlife conservation brought about as by-products of the Central Valley project.

With a minimum of $2 million annually as the recreational value and fishery values of at least $5 million annually created by the project, it is evident that it has generated a substantial contribution of at least $7 million to the economy of the valley and the Nation—one which more than returns each year the total capital cost of $5 million for the facilities built to bring about this conservation.

APPENDIX

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APPENDIX

TABLE 1.—*Farmland, cropland harvested, woodland pasture, other pasture,*[1] *Central Valley*

	1945	1950
Number of farms	55,519	57,108
Land in farms—acres	16,556,108	17,053,219
Land area—do	26,784,400	26,784,400
Cropland harvested (1944)—do	4,210,552	4,744,536
Number of farms reporting	45,171	46,184
Woodland pastured—acres	1,257,198	2,486,970
Other pasture not woodland or cropland—do	8,145,581	6,211,504

[1] Source: Census of Agriculture, U. S. Department of Commerce. 1950.

TABLE 2.—*Irrigated farms—number, acreage, and average size—Central Valley, 1950* [1]

Number of farms	47,492	Woodland pastured—acres	1,111,493
Proportion of all farms—percent	83.2	Other pasture not cropland and woodland—acres	3,300,191
Land in irrigated farms—acres	11,595,333	Irrigated cropland harvested—do	3,536,512
Average size of farms—do	244.2	Irrigated pasture—do	693,154
Number of farms reporting	42,061		
Cropland harvested—acres	4,274,205		

[1] Source: United States census of agriculture, Department of Commerce, 1950.

TABLE 3.—*Cash farm income for major crop groups in California and in the Central Valley, 1940–53*

[In thousands of dollars]

Item	California			Cental Valley counties	
	1940 [1]	1953 [1]	Percentage change from 1940	1953	Percent of State cash farm income 1953
Total cash farm income [2]	$672,956	$2,608,451	287.6	$1,304,000	50.0
All livestock and products	232,188	944,663	306.85	[3] 373,400	39.5
All crops	418,928	1,653,748	294.8	[3] 930,600	56.3
Cotton and seed	24,835	380,978	1,434.0	331,832	[4] 87.1
Vegetables	123,498	424,517	243.7	166,835	[5] 39.3
All fruits and nuts	196,532	484,289	146.4	196,621	[5] 40.6
Rice	5,312	60,806	1,044.7	60,806	[6] 100.0
All other crops	68,751	303,158	341.0	174,506	57.6

[1] Source: U. S. Department of Agriculture, Bureau of Agricultural Economics, as shown in 1954 Economic Survey of California, California State Chamber of Commerce.
[2] Includes Government payments.
[3] California Crop and Livestock Reporting Service. Estimated.
[4] California Crop and Livestock Reporting Service. Estimate of bales produced in 1953, used to estimate 1953 value of cash farm income for cotton.
[5] Census of agriculture, 1950. Proportions of cash farm income for vegetables and fruit and nuts used to estimate value of 1953 cash farm income for these crops.
[6] Palo Verde and Imperial Valley Irrigation Districts planted 1,500 acres of the 412,000 acres of rice grown in the State.

TABLE 4.—*Value of cash farm income and production for selected crops of Central Valley area, compared to United States, for 1953*

Crop	Cash farm income			Production		
	Central Valley (thousands) [1]	United States (thousands) [2]	Percent, United States	Central Valley (thousands)	United States (thousands) [3]	Percent, United States
All livestock	$373,400	$17,209,000	2.1			
All crops	930,600	14,035,000	6.6			
Cotton and seed	331,832	3,178,000	10.4	1,534 bales	16,437 bales	9.3
Vegetables	166,835	1,221,000	13.6			
Asparagus	12,733	36,510	34.9	61.6 tons [3]	151.3 tons	40.7
Cantaloupes	12,844	67,700	18.1	141.0 tons [3]	548.6 tons	25.8
All fruit and nuts	196,621	1,240,000	15.8			
Grapes	78,522	123,000	63.8	1,947.0 tons [3]	2,641.0 tons	73.7
Rice	60,806	243,000	25.0	597.4 tons	2,626.5 tons	23.1
Figs	5,023	5,099	98.5			
Almonds	15,902	18,278	87.0			
Olives	4,768	5,744	83.0			

[1] Source: California Crop and Livestock Reporting Service.
[2] Source: The Farm Income Situation, U. S. Department of Agriculture, Sept. 14, 1955.
[3] Estimated for Central Valley area, United States values from Statistical Abstract of United States, 1954.

TABLE 5.—*Productivity per agricultural worker and per capita of Central Valley area, as compared to California and the United States*

Area	1953 cash farm income	
	Per worker in agriculture	Per capita of farm population [1]
San Joaquin Valley	[2] $6,903	$4,378
Sacramento Valley	[2] 6,867	3,482
Central Valley (18 counties)	[2] 6,894	4,145
California	[3] 5,550	3,905
United States	[4] 3,635	1,250

[1] Estimated by Bureau of Reclamation based on 1950 census of population adjusted, and cash farm income as in footnote 2, and as in Statistical Abstract of United States, 1954.
[2] Source: Estimates for 1953 by California Crop and Livestock Reporting Service and California Department of Employment, Research and Statistics Division.
[3] Source: Economic Survey of California, 1954, California State Chamber of Commerce, pp. 584, 590.
[4] Source: Tables 231 and 760, Statistical Abstract of the United States, 1954.

TABLE 6.—*Population of Central Valley area (1860–1975)*

Year	Population [1]	Percent increase		
		Central Valley	California	United States
1860	97,333			
1870—June 1	138,959	42.8	47.4	22.6
1880—June 1	196,828	41.6	54.3	30.0
1890—June 1	256,864	30.5	40.3	25.5
1900—June 1	299,296	16.5	22.4	20.7
1910—Apr. 15	459,998	53.7	60.1	21.7
1920—Jan. 1	671,570	46.0	44.1	14.9
1930—Apr. 1	858,774	27.9	65.7	16.1
1940—Apr. 1	1,125,731	31.1	21.7	7.2
1950—Apr. 1	1,756,571	56.0	53.3	14.5
1955—July 1	2,024,600	15.3	23.1	9.7
1975	3,090,000	52.7		

[1] Source: 1860–1950, United States census; 1954 and 1975, State department of finance, financial research section. See also data collected by Bureau, S. Doc. 113, p. 196.

TABLE 7.—*Changes in irrigated acreage, employment, and farm population, 1930–54 (Central Valley)*

	1930	1953	Percent increase
Irrigated acreage	[1] 2,978,874	[1] 4,229,666	42.0
Employment in agriculture	[2] 130,687	[3] 189,125	44.7
Employment in all industries	[2] 364,820	[3] 713,250	95.5
Farm population	[2] 266,082	[4] 314,600	18.2

[1] Source: United States census. Data for 1950 shown in 1953 column.
[2] Source: United States census, 1950.
[3] State department of employment, research and statistics division. Estimate.
[4] Bureau of Reclamation. Estimate.

TABLE 8.—*Relative growth of population and irrigation, Central Valley area, 1890–1950*

Year	Population [1]	Average increase per decade	Irrigated acreage [2]	Average increase per decade
		Percent		*Percent*
1890	256,864		1,000,000	
1930	858,774	[3] 58.5	2,978,875	[3] 49.4
1940	1,125,731	31.0	3,500,000	17.5
1950	1,756,571	56.0	4,229,666	20.8

[1] Source: United States census of population.
[2] Source: United States census of agriculture.
[3] Average per decade, 1890 to 1930.

TABLE 9.—*Civilian employment by major industry groups, Central Valley area, compared with employment in California and the United States*

Industry group	Central Valley project area								California, 1953		United States, 1953	
	1930		1940		1950		1953					
	(1)	Percent	(1)	Percent	(1)	Percent	(2)	Percent	(2)	Percent	(5)	Percent
Agriculture [3]	130,687	35.8	109,286	29.1	129,297	21.6	189,125	26.5	470,000	9.5	6,528,000	11.6
Mining	11,050	3.0	13,640	3.6	10,717	1.8	12,190	1.7	39,000	.8	844,000	1.5
Construction	15,636	4.3	22,694	6.0	46,428	7.8	39,150	5.5	316,000	6.4	2,644,000	4.7
Manufacturing	49,174	13.5	34,907	9.3	65,349	10.9	65,785	9.2	1,104,000	22.3	17,259,000	30.7
Transportation and communication	31,774	8.7	28,439	7.6	46,908	7.8	51,150	7.2	355,000	7.2	4,224,000	7.5
Trade (wholesale and retail)	45,572	12.5	68,073	18.1	121,568	20.3	142,500	20.0	1,086,000	21.9	10,553,000	18.8
Service [4]	60,617	16.6	73,256	19.6	121,172	20.3	127,850	17.9	943,000	19.0	7,511,000	13.4
Public administration	9,453	2.6	19,713	5.3	48,508	8.1	85,500	12.0	644,000	13.0	6,645,000	11.8
Industry not reported	10,857	3.0	5,429	1.4	8,207	1.4						
Total	364,820	100.0	375,437	100.0	598,154	100.0	713,250	100.0	4,957,000	100.0	56,188,000	100.0

[1] United States census.
[2] State department of employment, research and statistics division.
[3] Includes some forestry and fishing.
[4] Includes finance and professional services.
[5] Statistical Abstract of United States, 1954, pp. 196 and 200.

TABLE 10.—*Employment and wages and salaries in agriculture and associated manufactures and transportation, Central Valley, 1953* [1]

	Month of—		Annual wages and salaries
	April	September	
			Thousands
On farm	189,125	272,625	[2] $267,221
Processing agriculture products	25,716	41,256	112,000
Assembly and packing agriculture products	4,140	8,078	18,000
Transportation of agriculture products	[3] 15,000	[3] 20,000	[3] 70,000
Total	233,981	341,959	467,000
Percent of all employment	32.8	47.9	

[1] Source: California Department of Employment, Research and Statistics Division.
[2] Source: California State Chamber of Commerce.
[3] Estimate of rail and trucking employment, Bureau of Reclamation.

TABLE 11.—*Estimated total employment in Central Valley area, April 1953*

Industry group	Total employment		
	San Joaquin Valley	Sacramento Valley	Central Valley
Total all industries	448,950	264,300	713,250
Agriculture, forestry, and fishing	147,650	41,475	189,125
Mineral extraction	10,590	1,600	12,190
Contract construction	23,100	16,050	39,150
Manufacturing	42,060	23,725	65,785
Transportation, communication, and public utilities	28,125	23,025	51,150
Wholesale and retail trade	88,550	53,950	142,500
Finance, insurance, and real estate	9,750	8,125	17,875
Service	69,200	40,775	109,975
Government	29,925	55,575	85,500

TABLE 12.—*1953 income, civilian residents, Central Valley area* [1]

[In thousands]

County	Wages and salaries	Proprietor's net income	Dividends, interest, net rents	Other income	All income	Per capita
Sacramento Valley:						
Butte	$57,775	$11,828	$12,924	$9,690	$92,217	
Colusa	10,959	9,933	2,395	1,308	24,595	
Glenn	11,715	10,143	3,043	1,745	26,646	
Sacramento	470,464	95,875	59,706	36,178	662,223	
Shasta	52,335	11,765	6,934	5,943	76,977	
Sutter	17,218	7,600	4,861	2,644	8,451	
Tehama	26,412	15,553	5,769	2,953	50,687	
Solano	173,063	26,644	18,894	11,925	229,526	
Yolo	43,569	17,954	9,686	5,000	76,209	
Yuba	26,463	11,646	5,704	4,417	48,230	
Subtotal	889,973	217,941	129,916	81,803	1,295,761	
San Joaquin Valley:						
Kern	289,256	98,424	46,515	27,420	461,615	
Kings	37,303	19,297	8,780	5,729	71,109	
Tulare	114,479	68,964	30,323	20,230	233,996	
Fresno	299,161	132,904	54,930	36,170	523,165	
Madera	25,675	20,539	7,440	5,081	191,387	
Merced	52,344	32,181	14,025	8,236	106,786	
Stanislaus	121,277	50,062	25,699	19,785	216,823	
San Joaquin	259,131	77,817	44,063	27,581	408,592	
Subtotal	1,198,626	500,188	231,775	150,232	2,213,473	
Central Valley total	2,088,599	718,129	361,691	232,035	3,509,234	$1,797
State total	$16,498,700	$3,446,600	$2,785,000	$1,447,400	$24,177,700	$2,039
Percent, State total	14.5					
United States total	[2] $286,400,000					$1,735

[1] Source: California State Chamber of Commerce.
[2] Survey of Current Business, 1954, U. S. Department of Commerce, P. S. 1.

TABLE 13.—*Market indices and level of living data, Central Valley area, 1950–54*

Total market	Percent of all units or reporting units	
	Central Valley area	United States
Total market house improvements (1950): [1]		
Hot and cold piped running water	79.2	70.1
Inside toilets for exclusive use	78.3	71.4
Electric lights	98.2	94.0
Mechanical refrigerators	82.7	80.2
Radios	94.1	95.7
	Number	
Number of autos (1953) [2]	747,562	43,653,545
Number of persons per auto (1953)	2.61	3.62
Number of residential telephones (1954) [3]	389,637	28,988,008
Number of persons per phone unit	5.01	5.45
Residential use of electricity:		
Kilowatt-hours per residence, 1954	[3] 3,071	2,594
Kilowatt-hours per residence, 1944	[4] 1,584	1,151
Increase, 1944 to 1954	1,496	1,398
Farm market (1950): [5]		
Farm telephones	30,225	1,866,109
Farms electrified	53,047	2,787,624
Electric water pumps	47,341	2,018,578
Home freezers	11,460	650,512
Milking machines	10,716	636,341
Combines	4,973	713,633
Trucks	47,831	1,490,300
Tractors	62,914	2,421,747

[1] United States housing census, 1950.
[2] Statistical Abstract of the United States, 1954.
[3] Pacific Gas & Electric Co. 6 divisions and Sacramento Municipal Utility District.
[4] Pacific Gas & Electric Co. 6 divisions.
[5] United States census of agriculture, 1950.

TABLE 14.—*Carloads of agricultural products shipped and rail revenues received, Central Valley area, 1953*

[Carloads]

Commodity	Number	Percent of all California	Revenues [1]
Fruits	[2] 40,381		$29,704,264
Truck	[2] 64,461		34,194,627
Cotton and seed	[3] 42,804	[3] 87.0	19,325,658
Rice	[1] 3,800	100.0	2,064,400
Alfalfa (hay)	[4] 777	70.0	167,090
Barley	[4] 4,133	72.5	1,168,555
Wheat	[4] 6,027	61.5	544,910
Sugar beets	[4] 18,291	54.6	1,371,879
Dried beans	[4] 738	52.7	130,960
Other	[4] 4,200	50.0	378,800
Total	185,612		89,051,143

[1] Based on average per car as shown in Carload Waybill Statistics, Products of Agriculture, 1953, Interstate Commerce Commission Bureau of Transport Economics and Statistics.
[2] Source: California Crop and Livestock Reporting Service. Point of origin data.
[3] Based on 87 percent of all California cotton from Central Valley area.
[4] Based on proportion of State production grown in the Central Valley as shown in 1950 census, and carloadings for California shown in Carload Waybill Statistics, Products of Agriculture, 1953, Interstate Commerce Commission Bureau of Transport Economics and Statistics.

TABLE 15.—*Project water deliveries to irrigation districts in the San Joaquin Valley—Acreage irrigated and proportion of water needs provided by project, 1948–54*

Year	Area [1] irrigated (acres)	Project water delivered		Total crop (acre-feet)	Irrigated requirement (acre-feet per acre)	Project water as percent C. I. R.
		Acre-feet	Acre-feet per acre			
1948	186,197	[2] 140,000	0.75	470,813	2.24	29.7
1949	304,782	315,119	1.03	713,190	2.34	44.2
1950	473,662	398,423	.84	1,065,740	2.25	[3] 37.4
1951	523,889	554,800	1.06	1,230,484	2.34	45.1
1952	568,290	707,597	1.25	1,204,775	2.12	58.7
1953	610,207	988,757	1.56	1,444,665	2.28	68.4
1954	640,366	1,098,099	1.71	1,518,123	2.37	72.3

[1] Area irrigated will differ at times from annual crop and livestock report because summations of crops in districts as shown using water not decreased by "multiple cropped" and "residue crops" as in irrigated area.
[2] Data not available; estimated.
[3] Because of adequate water supply the requirement for supplemental water was proportionately lower than in the preceding and subsequent years.

TABLE 16.—*Diversions from Sacramento River and acreage irrigated, by crops.*[1] *Sacramento Valley, 1944 and 1953*

Year	Acreage			Diversions (acre-feet)
	General crops	Rice	Total	
1944	201,526	146,235	347,761	1,999,008
1953	250,611	194,260	444,871	2,598,642
Increase	49,085	48,025	97,110	[2] 599,634
Increase, percent	24.3	32.8	27.9	30

[1] Source: Report of Water Supervision, Sacramento-San Joaquin, State division of water resources, 1953, pp. 133–134; includes diversions from lower Butte Creek, Butte Slough, Colusa Trough, and Back Borrow Pit, Tisdale Pass, Sutter Bypass, Sacramento Slough, Yolo Bypass (Tule Canal), Back Borrow Pit of Reclamation District 1000, Knight's Landing Cut, Delta Uplands, and Cache Slough.
[2] A small percentage of these increased diversions may come from sources other than the Sacramento River.

TABLE 17.—*Cash farm income of all districts served water by Central Valley project in San Joaquin Valley, and estimated amount attributable to project water for years 1948–54*

Year	Cash farm income [1]	Percent of crop irrigation requirement provided by Central Valley project	Cash farm income due to Central Valley project water
1948	$44,000,385	29.7	$13,068,000
1949	66,737,446	44.2	29,498,000
1950	141,944,693	37.4	53,087,000
1951	201,819,319	45.1	91,021,000
1952	212,455,976	58.7	124,712,000
1953	189,299,910	68.4	129,481,000
1954	231,043,501	72.3	167,044,000
Total	1,087,301,230	55.9	607,911,000

[1] Includes amount from livestock and livestock products equal to the proportion of total cash farm income for the valley counties which the income from livestock and products for the valley counties represents.

TABLE 18.—*1953 cash farm income for area irrigated by increased diversions from Sacramento River, 1944–53*

Crop group	Percent	Acres	Value per acre	Total value
Cereals	54.17	52,609	$162	$8,524,000
Forage except pasture	8.32	8,078	86	691,000
Field crops	8.90	8,642	183	1,584,000
Seeds	.13	125	96	12,000
Truck	3.33	3,233	411	1,329,000
Fruits and nuts	9.33	9,060	400	3,624,000
Subtotal	84.18	81,747	193	15,764,000
Livestock and livestock products	14.59	14,169		[1] 7,094,000
Not pastured or harvested	1.23	1,194		
Total	100.00	97,110	235	22,858,000
Rounded				23,000,000

[1] Based on the percentage which livestock and livestock products represented of the value of all crops in the 10 counties in the Sacramento Valley included in this study.

TABLE 19.—*Change from nonirrigated to irrigated land, Friant-Kern and Madera Canal service areas, 1948–53*

[Acres]

Year	Irrigated land	Dry farmed land	Dry pasture land
1953 [1]	481,446	22,937	46,871
1948 [2]	416,174	72,650	62,430
Change	+65,272	−49,713	−15,559

[1] Source: 1953 crop reports.
[2] Source: Land-use surveys of districts with long-term water-service contracts (1946–51) adjusted to conform to 1953 reporting criteria.

TABLE 20.—*Farm real estate: Average value per acre, by type of land, San Joaquin Valley, 1949–53* [1]

Year	Irrigated land	Dry farming land	Grazing land
1949	$498.00	$129.00	$49.00
1950	460.00	112.00	46.00
1951	571.00	155.00	57.00
1952	687.00	180.00	79.00
1953	703.00	220.00	86.00
Mean (1950–53)	600.50	174.50	67.50

[1] Includes following counties: San Joaquin, Stanislaus, Merced, Madera, Fresno, Tulare, Kings, and Kern.

Source: Special tabulation, Land Values Unit, PERB—Agricultural Research Service, U. S. Department of Agriculture, September 1955.

TABLE 21.—*Amount of Federal expenditures for materials for Central Valley project,* [1] *by regions*

Region	Value	Percent
Pacific (Washington, Oregon, California)	$88,662,621	67.4
East North Central (Wisconsin, Michigan, Illinois, Ohio, Indiana)	14,584,749	11.0
Middle Atlantic (New York, New Jersey, Pennsylvania)	17,036,748	12.9
Mountain (Idaho, Montana, Wyoming, Nevada, Utah, Colorado, Arizona, New Mexico)	4,060,682	3.0
South Atlantic (West Virginia, Virginia, Delaware, North Carolina, Maryland, South Carolina, Georgia, Florida)	2,858,044	2.2
New England (Maine, New Hampshire, Massachusetts, Vermont, Rhode Island, Connecticut)	1,599,469	1.2
East South Central (Kentucky, Tennessee, Mississippi, Alabama)	1,430,623	1.0
West North Central (North Dakota, South Dakota, Minnesota, Nebraska, Iowa, Kansas, Missouri)	1,185,914	.9
West South Central (Oklahoma, Texas, Arkansas, Louisiana)	153,810	.11
District of Columbia	200,744	.15
Hawaii	194,499	.14
Total	131,967,903	100.0

[1] For period up to June 1, 1951, and from September 1953 to May 1955.

TABLE 22.—*Anticipated acreage, water supply, and future crop income for selected additions to Central Valley project under construction or proposed*

Project unit or division	Acreage to be irrigated	Water supply	Estimated gross crop income
	Acres	*Acre-feet*	
Sacramento River canals unit	205,400	[1] 612,000	$28,000,000
Sly Park unit	8,750	17,500	4,872,000
Solano project [2]	89,000	216,000	17,000,000
San Luis unit	440,000	1,250,000	107,451,000
Folsom South Canal	168,000	440,000	36,411,000
Total	911,150	2,535,500	193,734,000

[1] A large part of this water will be supplied by the Trinity River division as will additional water for acreage along the Delta-Mendota Canal.
[2] Separate project.

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